Phase I Remedial Investigation
Pasco Landfill
Pasco, Washington

Volume II - Sampling and Analysis Plan

Part 1 - Field Sampling Plan
Part 2 - Quality Assurance Project Plan
Part 3 - Investigative Waste Management Plan

November 1992

Prepared for:

Pasco Landfill PLP Group

Project 624419

Prepared by:

BURLINGTON ENVIRONMENTAL INC.
Technical Services Division
7440 West Marginal Way South
Seattle, Washington 98108-4141
(206) 767-3306

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FSP

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ABSTRACT

The Phase I Remedial Investigation Work Plan for the Pasco Landfill in Pasco, Washington describes the various steps or phases essential to the investigation process and defines the activities that will be conducted during this investigation. This Phase I Remedial Investigation will be completed under an Agreed Order with the Washington Department of Ecology (Order No. DE92TC-E105) and in compliance with the Model Toxics Control Act (Chapter 70.105D RCW and Chapter 173-340 WAC). Because the Pasco Landfill site is on the National Priority List, the Phase I Remedial Investigation will also be conducted in a manner consistent with the National Contingency Plan (40 CFR Part 300).

The objective of this investigation is to gain additional information on the nature and extent of contamination in the air, soil, and groundwater near potential contaminant sources at the Pasco Landfill. A Preliminary Risk Assessment will also be completed. This Work Plan describes the various steps proposed for gathering the necessary site characterization information and data and for performing the Preliminary Risk Assessment.

As part of the Work Plan (Volume I), a Sampling and Analysis Plan (Volume II), a Data Management Plan (Volume III), a Health and Safety Plan (Volume IV), and a Public Participation Plan (Volume V) have been developed for the performance of this project. Completion of the work defined in these planning documents will be followed by a Phase II Remedial Investigation (if necessary) and a Feasibility Study. The Washington Department of Ecology will ascertain the need for additional remedial investigation activities and the scope of the Feasibility Study based on the findings from the Phase I Remedial Investigation. Following the Feasibility Study, the need for remedial action, if any, will be determined by the Washington Department of Ecology.

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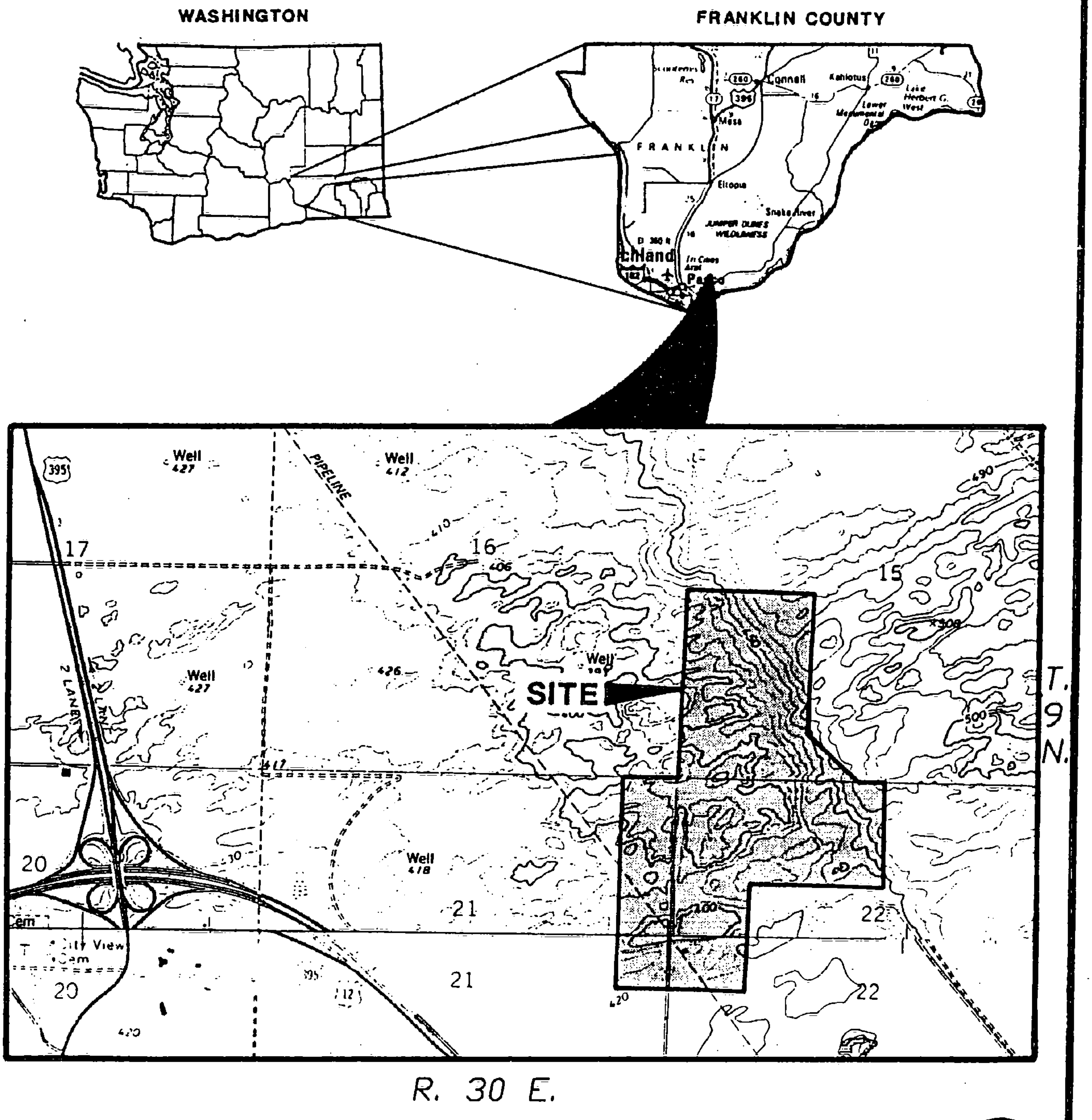
1 INTRODUCTION

This Field Sampling Plan (FSP) was prepared for the Pasco Potentially Liable Party (PLP) Group by Burlington Environmental Inc. (Burlington). The objective of this FSP is to define the Phase I Remedial Investigation (RI) field activities proposed for the environmental investigation of the Pasco Landfill Site (the site) in Pasco, Washington. The location of the site is shown in Figure 1. Implementation of the activities described in this FSP is intended to produce data that will be used to characterize the site, and to evaluate actual or potential hazards to human health and the environment which may be attributable to the hazardous substances at the site.

This FSP was prepared to comply with the RI requirements of the Washington Department of Ecology (Ecology) for site investigations under the Model Toxics Control Act (MTCA). The FSP was also developed in general compliance with U.S. Environmental Protection Agency (USEPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance, including A Compendium of Superfund Field Operation Methods (USEPA, 1987).

Existing site information and the data generated through the Phase I RI will be evaluated and presented in a summary report. Details of the report format and content can be found in the Phase I RI Work Plan.



SCALE IS VARIABLE

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SITE LOCATION MAP

PASCO LANDFILL PASCO, WASHINGTON 624419	FIGURE 1

Modified from U. S. Geological Survey Glade and Pasco, Washington quadrangle, photorevised 1973 and 1979.

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BR 10/15/92		JW	

2 SITE CHARACTERIZATION ACTIVITIES

The field investigation portion of this Phase I RI will involve collection of samples from various media, including 1) surficial and subsurface soil, 2) groundwater, 3) soil-gas, and 4) landfill gas. Surface geophysical surveys will be performed to verify the location of closed landfill cells. Also, a soil-gas survey is planned as a preliminary assessment step for evaluating the extent of volatile organic compound (VOC) groundwater contamination detected in several existing site wells.

An overview of the proposed survey areas and sample locations for this phase of the RI are presented in Figures 2 and 3. These proposed survey and sampling locations are subject to modification if more appropriate sampling locations are identified during field investigation activities. The initial site setup tasks and the methods of data acquisition and sample collection and analysis are described in Sections 2.1 through 2.17.

2.1 Mobilization/Site Setup

Staff and equipment will be mobilized to the site, and field office and support areas will be established. The field office will consist of an office trailer with a telephone, a copy machine, and health and safety equipment. The support areas will consist of a supply trailer, a fenced yard to secure well materials and exploratory equipment, and an equipment and personnel decontamination pad. Locations for these on-site facilities will be coordinated with the landfill owner/operator.

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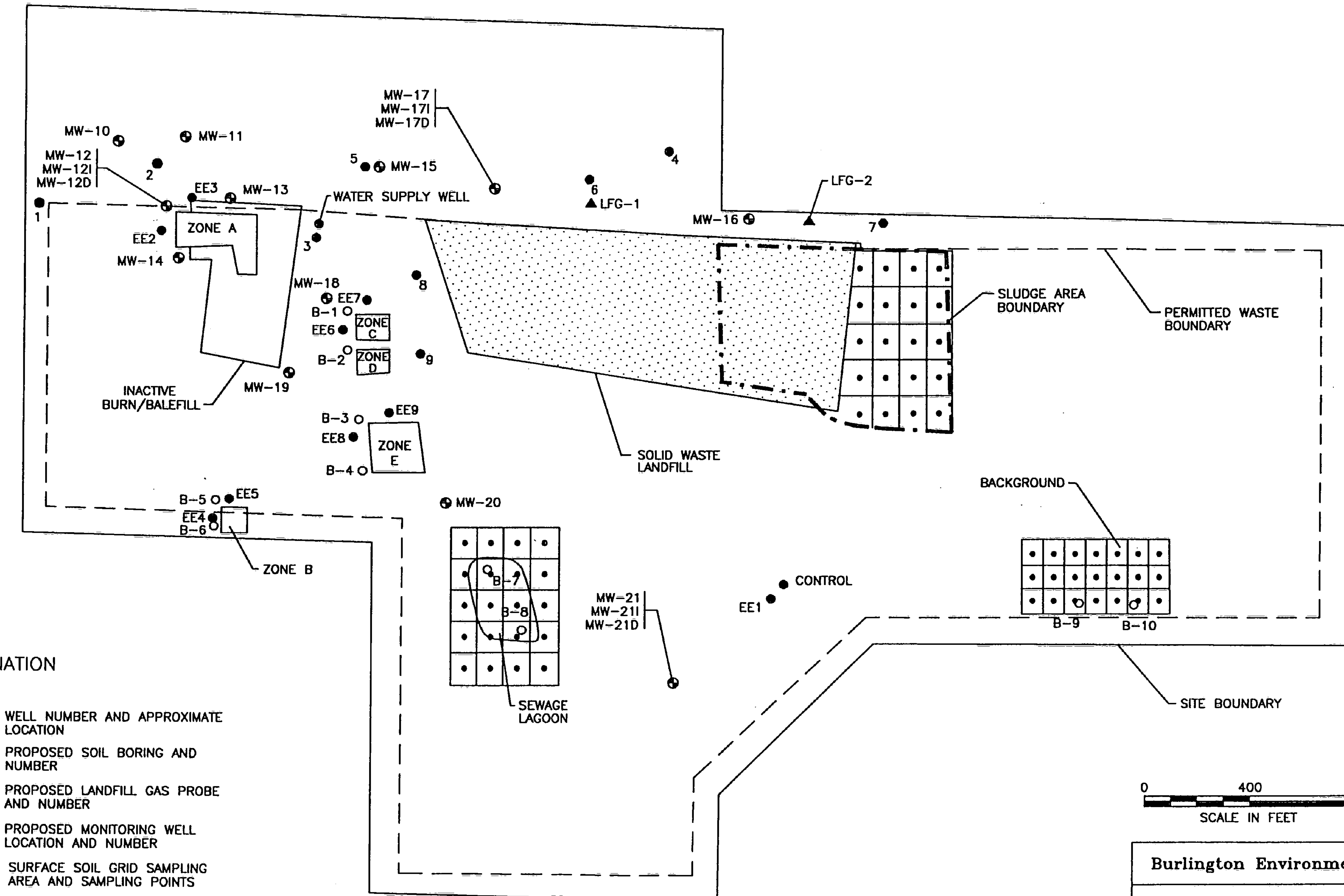

EXPLANATION

● EE2	WELL NUMBER AND APPROXIMATE LOCATION
○ B-3	PROPOSED SOIL BORING AND NUMBER
▲ LFG-1	PROPOSED LANDFILL GAS PROBE AND NUMBER
⊕ MW-10	PROPOSED MONITORING WELL LOCATION AND NUMBER
• | •	SURFACE SOIL GRID SAMPLING AREA AND SAMPLING POINTS

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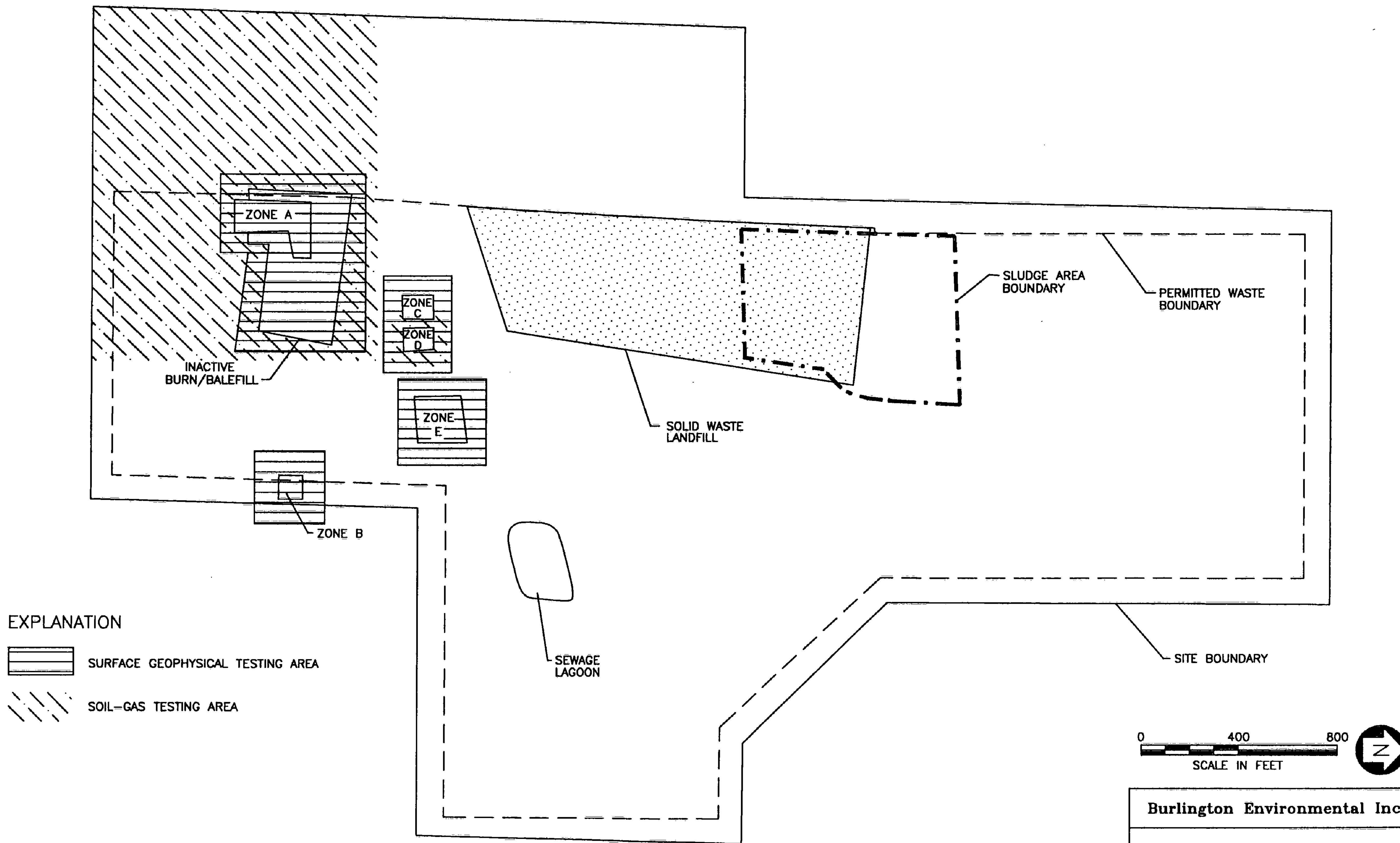
PROPOSED MONITORING WELLS, BORINGS, AND SURFACE SOIL TESTING AREAS

PASCO LANDFILL
PASCO, WASHINGTON
624419

FIGURE 2



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PROPOSED SURFACE GEOPHYSICAL AND SOIL-GAS TESTING AREAS

PASCO LANDFILL
PASCO, WASHINGTON
624419

FIGURE 3

2.2 Site Survey/Cell Location Verification

Concurrent with site setup and mobilization, an engineering survey of each of the potential source areas, the proposed geophysical survey areas, and soil sampling grids will be completed. Burial Zones A through E (shown on Figure 2) were surveyed at the time of closure in 1975. These survey data will be used for ground verification, with semi-permanent markers set at the corners of the zones. Two permanent benchmarks will be established for surveying of existing and new wells, soil sampling points, and geophysical survey locations. These data will be plotted on the base map of the site. Horizontal and vertical survey accuracy for the monitoring wells will be $\pm$ 0.10 and $\pm$ 0.01 feet, respectively. To the extent practicable, existing topographic maps will be used in conjunction with the survey data collected under this task to develop the site maps.

In addition to the data outlined above, the site maps will 1) delineate property boundaries and list adjacent property owners; 2) show aboveground tanks, buildings, utilities, septic systems, paved areas, easements, and rights-of-way; 3) show past known or suspected solid waste management and hazardous substance treatment, storage, or disposal areas; and 4) locate all groundwater supply, irrigation, and monitoring wells within a three-mile radius.

2.3 Surface Geophysical Surveying

Prior to any subsurface investigations, surface geophysical investigations are planned for the site over the areas shown on Figure 3. The purpose of the surface geophysical study is to field verify the survey information collected at closure of Zones A through E prior to any drilling or soil-gas work. With this field verification, drilling and soil-gas locations can be established as close as practical to the zones with limited risk of drilling into or through a closed cell or buried drums.

After the establishment of a survey grid, a combination of electromagnetics (EM) and magnetics, and ground-penetrating radar (GPR) will be used to perform a reconnaissance survey of the boundaries of the closed cells. In addition, a reconnaissance survey of each potential soil-gas location will be performed prior to soil-gas investigations as a precautionary measure. The data collected by these instruments will be interpreted by a consulting geophysicist, and maps of the interpreted cell boundaries will be generated prior to boring or well installation.

2.3.1 Magnetic Gradiometer Profiling

The magnetic survey method is based on the detection of contrasts in the magnetization of subsurface materials by passive surface measurements of the earth's magnetic field. The magnetic method has application in the search for naturally occurring concentrations of magnetic minerals, as well as in the search for buried man-made ferromagnetic (iron and steel) objects. The primary purpose of the magnetic survey will be to map the lateral limits of areas that contain metallic material, such as buried drums.

Ground magnetic surveying will be conducted using a GEM Systems Inc. GSM-19G Magnetic Gradiometer (or equivalent). The survey will be conducted by taking magnetic measurements at intervals of 10 feet along the pre-established geophysical profiles spaced 20 feet apart. Both total magnetic field and vertical magnetic gradient measurements will be simultaneously recorded in the digital memory of the magnetometer at each data station. The total field data should prove to be useful for assessment of the relative mass of buried metallic material, while the vertical gradient data should be the most useful for delineating the boundaries of the metallic fill.

Interpretation of the magnetic data will begin with downloading the digitally recorded field data to a computer for subsequent plotting of magnetic field strength and vertical magnetic gradient along each of the geophysical profiles. Analysis of these profiles will be carried out by an experienced contract geophysicist.

2.3.2 Electromagnetic Conductivity Profiling

EM conductivity surveying is a surface geophysical technique used to measure terrain conductivity, a term referring to the bulk electrical conductivity of subsurface materials. EM conductivity surveying is primarily a tool for rapid lateral mapping of variations in soil conductivity. Interpretation of the profiles will concentrate on mapping the lateral boundaries of landfill cells based on conductivity contrasts and correlation with direct soil sampling data from existing monitoring wells. The in-phase portion of the EM signal may also be useful for identification of the limits of burial of metallic materials on site, since the in-phase data are sensitive to buried metallics.

EM conductivity profiling will be accomplished using a Geonics Ltd. EM-31DL Terrain Conductivity Meter (or equivalent). The terrain conductivity meter has a transmitter coil that radiates an electromagnetic field and induces circular electrical currents (termed eddy currents) in the earth below the coils. These eddy currents in turn generate a secondary magnetic field. Both the primary field and the secondary magnetic field are detected by a receiver coil. The instrument converts the ratio of the two magnetic fields to a measurement of the apparent conductivity (terrain conductivity) of the subsurface. The terrain conductivity represents the cumulative subsurface conductivity from the ground surface to the effective depth of exploration of the instrument (about 20 feet for the EM-31).

The terrain conductivity data will be recorded digitally in the field using a portable datalogger (the Omnidata Polycorder or equivalent). This device provides an efficient RS-232C data interface for downloading of the field data to a computer. The Polycorder also permits the simultaneous acquisition of information from both the quadrature-phase and in-phase data channels of the EM-31. The quadrature phase of the secondary magnetic field yields information on the apparent conductivity of the soil, while the in-phase portion of the secondary magnetic field provides a measure of the terrain magnetic susceptibility.

The EM-31 survey will be conducted by traversing a pre-established survey area (see Figure 3) and recording digital data at 10-foot intervals along geophysical profiles spaced 20 feet apart. At each measurement station both quadrature-phase and in-phase data will be simultaneously recorded parallel to the line of profile. These field data will subsequently be transferred to a computer for processing and plotting of data profiles along the lines of traverse.

2.3.3 Ground-Penetrating Radar

The GPR survey will be conducted after completion and preliminary analysis of the EM and magnetics surveys. The intent of the GPR survey is to confirm that adequate resolution of landfill cells has been acquired through integration of EM and magnetics with the existing cell boundary surveys. Four GPR lines 100 feet long will be run across the estimated boundaries of each cell. The resulting records will be examined to evaluate the cell boundary locations. If these locations are consistent with those identified by the previous geophysical surveys and the existing surveys, then no further GPR data will be acquired. If GPR results indicate that additional refinement of the boundaries is warranted, additional GPR surveys will be run over the landfill cell areas.

The GPR survey will be conducted using a Geophysical Survey Systems Inc. (GSSI) SIR-3 GPR System. The GSSI system consists of an instrument console, a transmitter/receiver antenna, and graphic and digital recorders. The GSSI system is an impulse radar system that transmits repetitive short-time-duration electromagnetic pulses into the ground from an antenna that is towed along the surface. These pulses are reflected from subsurface interfaces to the GPR antenna and are returned via cable to a control unit for processing and display. As the antenna is towed along a transect line, the reflected GPR signals are displayed on the graphic recorder as a vertical, two-dimensional continuous profile along the line of traverse. The graphic display (radargram) is similar to a geologic cross-section, although the subsurface soil interfaces and/or buried objects are displayed in terms of reflection time rather than depth.

GPR penetrations of 25-30 feet are common in dry resistive sands and gravels typical of the Pasco site. In order to explore these depths, a GSSI Model 3110 (120 megahertz) antenna will be utilized.

2.4 Soil-Gas Investigation

The soil-gas survey for the Pasco Landfill will be used as a rapid screening technique for mapping the extent of VOCs in subsurface pore space. This technique is expected to be effective adjacent to Zone A and the inactive Burn/Balefill potential source area where levels of VOCs are known to be present in the groundwater. The concentration of VOCs in the soil-gas will serve as an indirect indication of the VOCs in the groundwater. This should allow targeting of the VOC groundwater plume and placement of monitoring wells in the optimum locations.

Soil-gas samples will be collected over the areas shown in Figure 3 using Burlington's RECON® System. This system consists of a van-mounted hydraulic probe and intra-probe gas collection system. At each sampling location, the RECON System will be utilized to drive a 0.75-inch-diameter hollow steel probe as deep as geologic conditions will allow (estimated to be in the 30 to 40 feet depth range). After the probe is in place, a vacuum pump will be attached to the sampling port on the probe and a minimum of one probe volume of gas will be purged using the pump. After purging the probe, a representative soil-gas sample will be collected. Soil-gas samples will be analyzed for the target VOCs shown in Table 1 utilizing the RECON System's on-board gas chromatograph (GC). All RECON procedures will follow the guidelines in Burlington's RECON System Standard Operating Procedures provided in the Quality Assurance Project Plan (QAPP).

The initial soil-gas sampling points will be positioned around the perimeter of Zone A and the Burn/Balefill Area along the edges of the previously-surveyed geophysical grid. Locations along this perimeter may be constrained by access and the presence of waste. The location of the remaining sampling points will be based on the analytical results from the initial

Table 1

SOIL-GAS TARGET COMPOUNDS

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PASCO, WASHINGTON

Target Compound	Maximum Detection in Groundwater (ug/L)[1]	Expected RECON Detection Limit (ug/L)
1,1-Dichloroethene	250/EE-2	1.0
1,1-Dichloroethane	739/EE-3	1.0
trans-1,2-Dichloroethene	190/EE-3	1.0
Chloroform	703/EE-3	5.0
1,1,1-Trichloroethane	2,680/EE-3	1.0
Trichloroethene	1,880/EE-3	1.0
Tetrachloroethene	112/EE-3	1.0
Toluene	4,470/EE-3	1.0

[1]Corresponding groundwater monitoring well

ug/L - Micrograms per liter

soil-gas samples. An experienced Burlington hydrogeologist will be on-site during this soil-gas survey and, after review of the initial soil-gas samples, will position the step-out sampling points to most effectively define the distribution of the suspected VOC groundwater plume. It is estimated that 24 to 30 sampling points will be adequate. The exact number of sampling points will be determined in the field.

Soil-gas sampling will begin along the western edge of Zone A (see Figure 3). This area is immediately downgradient of a potential plume source and may contain the highest levels of target compounds in the soil-gas. If analysis of soil-gas from these areas indicates that levels of target compounds are below the resolution of the RECON analytical equipment, alternative sample collection and analytical methods will be warranted. The alternative method will consist of collecting a soil-gas sample using a Tedlar bag or a glass sample bulb (or equivalent) attached to the probe sampling port. These containers will be labelled according to the procedures outlined in Section 3.1 and stored in a cooler at 4 degrees Centigrade (°C) for shipment to a certified lab. Samples shipped to the lab will be analyzed for the target VOCs by USEPA SW-846 Method 8240.

Soil-gas samples will also be collected along the perimeters of Zone A and Zone D. Volatile wastes were disposed in both zones, and soil-gas samples along the zone perimeters are intended to monitor possible releases of VOC vapors from these zones. Samples will be collected from a depth of approximately 25 feet, if geologic conditions allow. All eight samples will be collected using Tedlar bags or glass sample bulbs and analyzed for VOCs at a certified laboratory by SW-846 Method 8240.

All probe holes will be abandoned after sampling. Abandonment will be accomplished by backfilling the probe hole with a bentonite slurry poured through a funnel placed into the surface opening after the rods have been retracted.

Between samples, all sampling equipment and probe rods will be decontaminated by pressure steam cleaning and then purging several volumes of air through the rods. Field quality control (QC) samples will include a minimum of one daily duplicate sample, a decontaminated equipment blank sample, and an ambient air sample. This QC approach will be applied to both the samples collected for on-site screening and off-site laboratory analysis.

2.5 Shallow Soil Sampling/Analysis

Shallow soil sampling is planned for three areas of the site: the former sludge management area, the former sewage lagoon management area, and a background area in the northeast corner of the site. The location of the proposed sampling grids are shown in Figure 2. The sample locations are established on a grid system such that approximately 20 samples will be collected from each area. One duplicate sample and one rinsate sample from a previous decontamination of sampling equipment will also be collected from each area.

Comparison of the analytical results from each area to the background data will involve a statistically based evaluation. Specifically, the quantile test or other statistically-based tests will be applied to the data to evaluate whether the results from each area are statistically equivalent to the background data. This quantile test was recently developed by Battelle Pacific Northwest Laboratories with USEPA support, and is designed for background-based cleanups at Superfund sites (Gilbert and Simpson, 1991).

2.5.1 Sludge Management and Background Areas

The following procedures will be used when collecting surface soil samples from the sludge management and background areas:

1. The sampling point, previously chosen and flagged, will be located.

2. Surface debris (twigs, rocks, and litter) will be carefully removed and discarded.

3. The surface soil sample will be collected from the top foot of soil.

4. The surface soil sample will be collected using precleaned stainless-steel scoops or trowels and transferred into sample bottles.

5. The Teflon liner in the cap will be checked and secured.

6. The sample bottle will be carefully labelled with the appropriate sample tag addressing all parameters.

7. All pertinent information will be recorded in the field logbook.

8. The sample will be transferred to the cooler and preserved at less than 4°C.

9. Steps 1 through 8 will be repeated throughout the sample area.

10. All equipment will be decontaminated before use and between sample locations as described in Section 4.

2.5.2 Sewage Lagoon Area

After management of sewage wastes in the sewage lagoon area was discontinued, fill was placed in and possibly around the area. After filling, the area was cultivated. To assess the presence of fill and the possible disturbance of soil by agricultural activity, several backhoe excavations will be dug in the lagoon area in an effort to define the depth to the base of the cultivated zone and the base of fill. The soil sampling depths will then be selected based on the soil characteristics as observed in the backhoe trenches. All samples will be collected from a depth of approximately one foot below the base of the fill, or one foot below the base of the cultivated zone at sampling points where fill is not present. The soil samples will be collected using a stainless-steel hand auger. The hand auger sampling process will proceed as follows:

1. The hand auger will be attached to an extension rod.

2. The hand auger will be placed at the surface location and turned until the prescribed sampling depth is reached.

3. The hand auger will be pulled out and the soil cuttings placed next to the hole.

4. The soil sample will be obtained from the bottom of the hole using the hand auger. The sample will be placed in a stainless-steel bowl using a precleaned, stainless-steel spoon or by using disposable spoons that are used only once.

5. Samples will be transferred from the stainless-steel bowl to the sample bottles using the stainless-steel spoon.

6. All equipment (including bowels and spoons) will be decontaminated before use and between sample collection points as described in Section 4.

7. All excess soil removed during augering will be drummed and handled in accordance with procedures outlined in the Investigative Waste Management Plan (IWMP).

The additional sample handling and documentation procedures outlined in steps 4 through 8 of Section 2.5.1 will be followed during collection of soil samples from the sewage lagoon area.

In the event that the depth to the base of fill, as observed in the backhoe trenches, exceeds the practical limit for hand augering, then samples from those areas will be collected using Burlington's RECON van or a conventional hollow-stem auger rig. The sample acquisition, handling, and documentation will be the same as that described for hand augering except that samples will be acquired using a split-spoon sampler, and the samples transferred directly from the split-spoon sampler to the sample bottles.

2.5.3 Shallow Soil Analysis

The shallow soil samples collected from the three surface areas will be analyzed for priority pollutant metals (PPMs) by SW-846 Method 6010, chlorinated pesticides and polychlorinated biphenyls (PCBs) by SW-846 Method 8080, organophosphorus pesticides by SW-846 Method 8140, and chlorinated herbicides by SW-846 Method 8150. Analysis of samples from these areas will include a radionuclide screen for gross alpha and beta activities using SW-846 Method 900.0 and 900.1, respectively. Samples from the sludge management and sewage lagoon areas will also be tested for semivolatile organics by SW-846 Method 8270. Six soil samples, two each from the sludge management, sewage lagoon, and background areas, will also be analyzed for total organic carbon (TOC) content by the American Association of State Transportation Officials (AASTO) Method T267-86 (equivalent to Standard Method 5130b). Results of these analyses will be used for input into future contaminant fate and transport models.

2.6 Soil Borings/Sampling Analysis

Ten soil borings (including two background borings, B-9 and B-10) will be drilled at the locations shown in Figure 2. These soil borings will be drilled to a depth just above the water table surface as determined by water levels in nearby monitoring wells. It is anticipated that all soil borings will be drilled using a hollow-stem auger method of drilling. Split-spoon samplers will be utilized for sample collection where subsurface conditions permit. Recovered soil samples will be described and logged at the drill rig by the site geologist. The description will include the amount of recovery, interval thickness, depth of lithologic changes, and color, grain-size distribution, and soil classification following the Unified Soil Classification System (USCS) in general accordance with ASTM D-2488, "Standard Recommended Practice for Description of Soils (Visual-Manual Procedure)". Levels of organic vapors in the borings will be monitored at regular intervals using a photoionization detector (PID).

The proposed boring depths, sample collection depths, and analytical methods for the soil samples are shown on Table 2. These are estimations that are subject to modifications based on the results of the ongoing field investigation. Boring and sampling depths may be modified based on subsurface soil conditions, results of field screening, and the depth to groundwater.

Sample handling and documentation will follow the procedures outlined in steps 4 through 8, Section 2.5.1. A duplicate sample will be collected for every 20 soil samples. One Type II deionized water field blank will be analyzed for each boring from which samples for VOC analysis are collected. In addition, each sample shipment containing samples for VOC analysis will be accompanied by a Type II deionized water trip blank.

In addition to the ten borings described above, a pilot boring will be drilled immediately offsetting the proposed location of Well MW-15. The purpose of this boring is to collect a sample of aquifer material from the proposed screen interval of MW-15. This will permit sieve analysis of the aquifer materials, and subsequent ordering of well screen and sand pack materials prior to drilling of MW-15. Three split-spoon samples will be collected from this pilot boring at intervals selected by the site geologist. An additional sample for sieve analysis will be collected from immediately below the groundwater surface.

All cuttings generated during drilling operations will be drummed and staged on site for later disposal in accordance with the IWMP. After boring installation and sampling, each boring will be abandoned. Abandonment procedures will consist of backfilling each boring to grade with bentonite chips. These bentonite chips will be hydrated in stages at intervals of 20 feet or less to insure full hydration over the entire length of the boring. If groundwater is encountered, a bentonite/cement mixture will be used to abandon the lower part of the boring to a depth of five feet above the groundwater surface. Upon abandonment, a three-foot stake with a fluorescent flag will be emplaced in the center of the abandoned boring. These stakes will mark the location of the borings for later surveying of vertical and horizontal position.

Table 2
PROPOSED SOIL BORING SUBSURFACE SOIL SAMPLING/ANALYSIS

PASCO LANDFILL
PASCO, WASHINGTON

Soil Boring	Approx. Sampling Intervals (ft.)	Subsurface Soil Samples						
		VOC[1]	SVOC[2]	Pest/PCB[3]	Herbicides[4]	Dioxin	PPM[5]	Radionuclides[6]
B-1 Proposed depth 60 ft.	10-12.5 25-27.5 40-42.5 60-62.5		X				X	
B-2 Proposed depth 60 ft.	10-12.5 25-27.5 40-42.5 60-62.5	X	X				X	
B-3 Proposed depth 60 ft.	10-12.5 25-27.5 40-42.5 60-62.5		X				X	
B-4 Proposed depth 70 ft.	10-12.5 25-27.5 45-47.5 70-72.5		X				X	
B-5 Proposed depth 40 ft.	10-12.5 20-22.5 30-32.5 40-42.5		X		X	X	X	
B-6 Proposed depth 40 ft.	10-12.5 20-22.5 30-32.5 40-42.5		X		X	X	X	

[1]VOC - Volatile Organic Compounds EPA Method 8240
[2]SVOC - Semivolatile Organic Compounds EPA Method 8270
[3]Pest/PCB - Organochlorine Pesticides/PCBs EPA Method 8080
[4]Herbicides EPA Method 8150
[5]PPM - Priority Pollutant Metals EPA Method 6010
[6]Radionuclides
Gross Alpha-Beta EPA Method 900.0
Gross Gamma EPA Method 901.1

Table 2, continued

PROPOSED SOIL BORING SUBSURFACE SOIL SAMPLING/ANALYSIS

PASCO LANDFILL
PASCO, WASHINGTON

Soil Boring	Approx. Sampling Intervals (ft.)	Subsurface Soil Samples						
		VOC[1]	SVOC[2]	Pest/PCB[3]	Herbicides[4]	Dioxin	PPM[5]	Radionuclides[6]
B-7 Proposed depth 60 ft.	10-12.5 25-27.5 40-42.5 60-62.5	X	X	X	X		X	X
B-8 Proposed depth 60 ft.	10-12.5 25-27.5 40-42.5 60-62.5		X	X	X		X	X
B-9 Proposed depth 50 ft.	10 samples - Depths to be determined			X	X		X	X
B-10 Proposed depth 50 ft.	10 samples - Depths to be determined			X	X		X	X

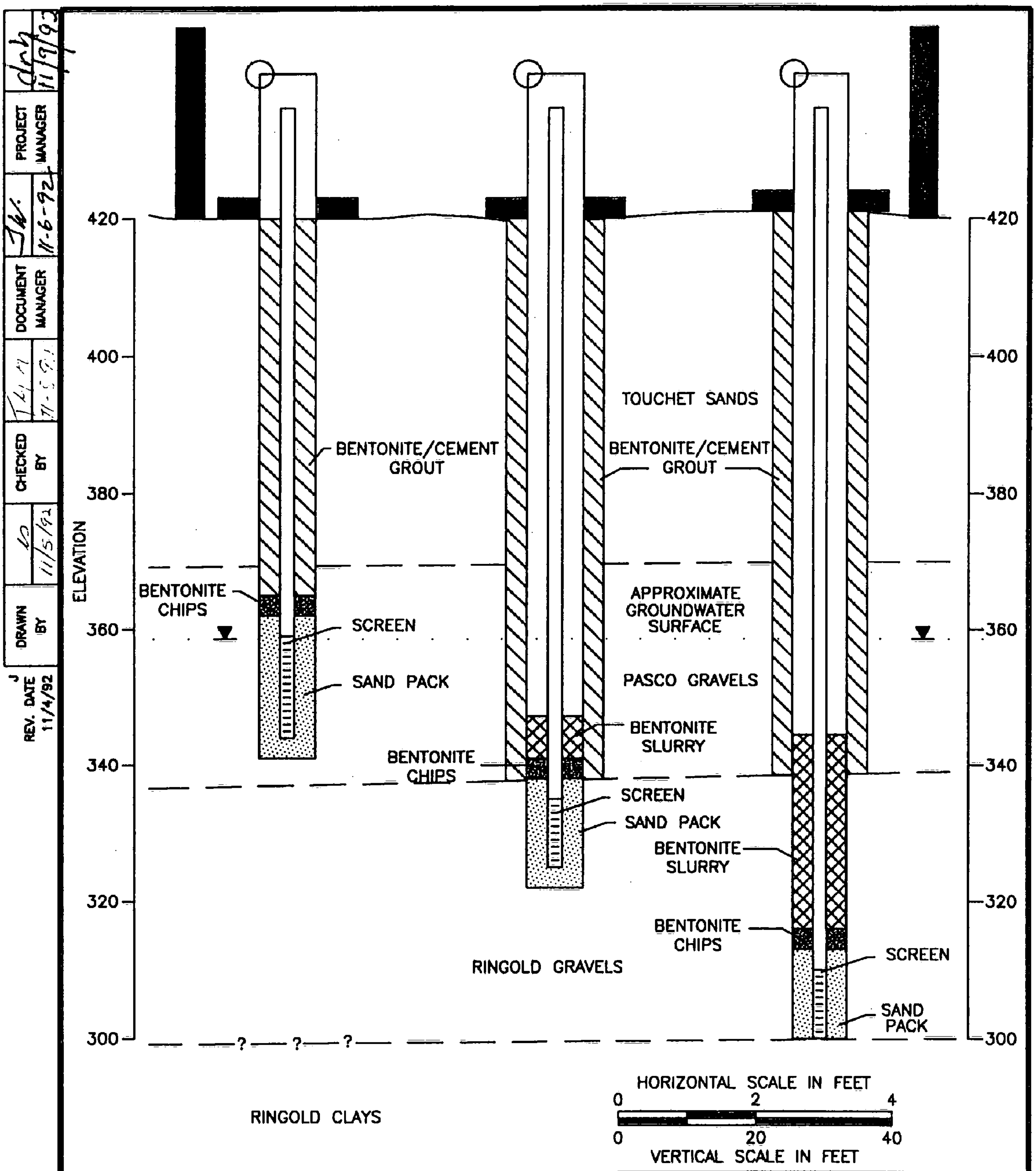
[1]VOC - Volatile Organic Compounds EPA Method 8240
[2]SVOC - Semivolatile Organic Compounds EPA Method 8270
[3]Pest/PCB - Organochlorine Pesticides/PCBs EPA Method 8080
[4]Herbicides EPA Method 8150
[5]PPM - Priority Pollutant Metals EPA Method 6010
[6]Radionuclides
Gross Alpha-Beta EPA Method 900.0
Gross Gamma EPA Method 901.1

2.7 Monitoring Well Installation

Eighteen monitoring wells are proposed for the site at the locations shown on Figure 2. These well locations are tentative and may be moved based on the results of the soil-gas and geophysical studies. Based on past drilling experience at the site, it is anticipated that all shallow wells can be drilled using a hollow-stem auger method of drilling. Intermediate and deep wells will be installed in separate borings and drilled with a hollow-stem auger or a combination of hollow-stem auger/air rotary methods. Figure 4 shows a typical well cluster installation. For both the intermediate and deep wells in each cluster, a permanent conductor casing will be installed to the base of the Pasco Gravels prior to drilling into the Ringold Gravels.

A soil sample for laboratory analysis will be collected during the drilling of selected groundwater monitoring wells by the same methods outlined for the soil borings in Section 2.6. of this FSP. The approximate sample depths and proposed laboratory analyses are listed in Table 3. Three additional soil samples will be collected from each well at depths determined by the field geologist. These samples will assist in refining stratigraphic relationships beneath the site. Sample description, handling, and documentation procedures will follow the procedures outlined in steps 4 through 8 of Section 2.5.1. All cuttings generated during drilling operations will be drummed and staged on site for later disposal in accordance with the IWMP. During drilling, organic vapor levels in the wellbore will be measured at regular intervals using a PID. Further details on ambient air monitoring during drilling are provided in the Health and Safety Plan (HASP).

The monitoring wells will be drilled to the approximate depths shown on Table 4. After completion of drilling operations at each location, wells will be installed in the boreholes through the auger or casing string. Each well will be constructed using 10 feet of 2-inch stainless-steel well screen and a combination of stainless-steel/polyvinyl chloride (PVC) riser to the surface.



Burlington Environmental Inc.

WELL CLUSTER SCHEMATIC

PASCO LANDFILL
PASCO, WASHINGTON
624419

FIGURE 4

Table 3
PROPOSED MONITORING WELL SUBSURFACE SOIL SAMPLING/ANALYSIS

PASCO LANDFILL
PASCO, WASHINGTON

Monitoring Well	Approx. Sample Depths (ft.)	Subsurface Soil Samples			
		VOC[1]	SVOC[2]	Pest/PCB[3]	PPM[4]
MW-10	60-62.5	X	X	X	X
MW-11	50-52.5	X	X	X	X
MW-12	67-69.5	X	X	X	X
MW-13	60-62.5	X	X	X	X
MW-14	60-62.5	X	X	X	X
MW-18	67-69.5	X	X	X	X
MW-19	48.5-50	X	X		X
MW-20	72.5-75	X	X	X	X
MW-21	66-68.5	X	X	X	X

[1]VOC - Volatile Organic Compounds EPA Method 8240
[2]SVOC - Semivolatile Organic Compounds EPA Method 8270
[3]Pest/PCB - Organochlorine Pesticides/PCBs EPA Method 8080
[4]PPM - Priority Pollutant Metals EPA Method 6010

The stainless-steel portion of the riser will extend a minimum of 10 feet above the static groundwater surface. An exception to the standard construction is MW-15, which will be constructed using 10 feet of 6-inch-diameter stainless-steel screen and a 6-inch-diameter stainless-steel/PVC riser to the surface. This construction will allow for installation of a high-capacity pump for a planned aquifer pumping test. All monitoring wells will be constructed using stainless-steel centralizers located at the base of the screen and top of the stainless riser.

Wire-wound screen of 0.010-inch slot size is proposed for all wells except MW-15. The slot size for Well MW-15 will be determined based on sieve analysis of aquifer materials from the adjacent pilot boring. For the shallow wells, the bottom 10 feet of the well will be screened so that the top of the well screen intercepts the groundwater surface. The screened interval for all wells will be selected by the field geologist after interpretation of field conditions. Figure 5 is an illustration of the construction details for a typical proposed shallow well.

A sand pack will be used to filter fines from the formation. The sand pack on all wells will extend a minimum of three feet above the well screen. For all wells except MW-15, the filter pack will consist of No. 10-20 Colorado silica sand unless visual examination of aquifer materials indicates that this size sand is inappropriate. For Well MW-15, sand pack gradation will be based on sieve analysis of aquifer materials from the adjacent pilot boring. Filter pack design for well MW-15 will follow the procedures of Driscoll (1986).

The on-site geologist will determine the need for an optional sump at the bottom of the wells, based on interpretation of the materials encountered. However, a sump will be included for the two deep wells.

After the well string is installed, the sand pack will be placed around the screen through the auger or casing string to a minimum of three feet above the top of the screen. A layer of bentonite chips at least three feet thick will be placed above the sand pack and hydrated. The remaining borehole annulus will be sealed with bentonite slurry to approximately three feet below the ground surface. The well will be grouted to ground surface with concrete. A locking metal well protector will be set in place using concrete. Bumper posts will be installed at three locations around the well.

Table 4
PROPOSED GROUNDWATER SAMPLING/ANALYSIS
PASCO LANDFILL
PASCO, WASHINGTON

Monitoring Well	Groundwater Samples						
	MFS[1]	VOC[2]	SVOC[3]	Pest/PCB[4]	Herbicides[5]	PPM[6]	Radionuclides[7]
MW-10 Proposed depth 70 ft.	X	X	X	X		X	
MW-11 Proposed depth 60 ft.	X	X	X	X		X	
MW-12 Proposed depth 77 ft.	X	X	X	X		X	
MW-12I Proposed depth 95 ft.	X	X					
MW-12D Proposed depth 120 ft.	X	X					
MW-13 Proposed depth 70 ft.	X	X	X	X		X	
MW-14 Proposed depth 70 ft.	X	X	X	X		X	
MW-15 Proposed depth 77 ft.	X	X	X	X	X	X	X
MW-16 Proposed depth 50 ft.	X	X	X	X	X	X	X
MW-17 Proposed depth 78 ft.	X	X	X	X	X	X	X

[1]MFS - Minimal Functional Standards
[2]VOC - Volatile Organic Compounds EPA Method 8240
[3]SVOC - Semivolatile Organic Compounds EPA Method 8270
[4]Pest/PCB - Organochlorine Pesticides/PCBs EPA Method 8080
[5]Herbicides EPA Method 8150
[6]PPM - Priority Pollutant Metals EPA Method 6010
[7]Radionuclides
Gross Alpha-Beta EPA Method 900.0
Gross Gamma EPA Method 901.1

Table 4, Continued
PROPOSED GROUNDWATER SAMPLING/ANALYSIS
PASCO LANDFILL
PASCO, WASHINGTON

Monitoring Well	Groundwater Samples						
	MFS[1]	VOC[2]	SVOC[3]	Pest/PCB[4]	Herbicides[5]	PPM[6]	Radionuclides[7]
MW-17I Proposed depth 95 ft.	X	X					
MW-17D Proposed depth 120 ft.	X	X					
MW-18 Proposed depth 77 ft.	X	X	X	X	X	X	X
MW-19 Proposed depth 58 ft.	X	X	X			X	
MW-20 Proposed depth 82 ft.		X	X	X		X	
MW-21 Proposed depth 76 ft.	X	X	X	X	X	X	X
MW-21I Proposed depth 95 ft.	X	X					
MW-21D Proposed depth 120 ft.	X	X					
Existing Wells							
1	X	X	X	X		X	
2	X	X	X	X		X	
3	X	X	X	X		X	
4	X	X	X	X	X	X	X

[1]MFS - Minimal Functional Standards
[2]VOC - Volatile Organic Compounds EPA Method 8240
[3]SVOC - Semivolatile Organic Compounds EPA Method 8270
[4]Pest/PCB - Organochlorine Pesticides/PCBs EPA Method 8080
[5]Herbicides EPA Method 8150
[6]PPM - Priority Pollutant Metals EPA Method 6010
[7]Radionuclides
Gross Alpha-Beta EPA Method 900.0
Gross Gamma EPA Method 901.1

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Table 4, Continued

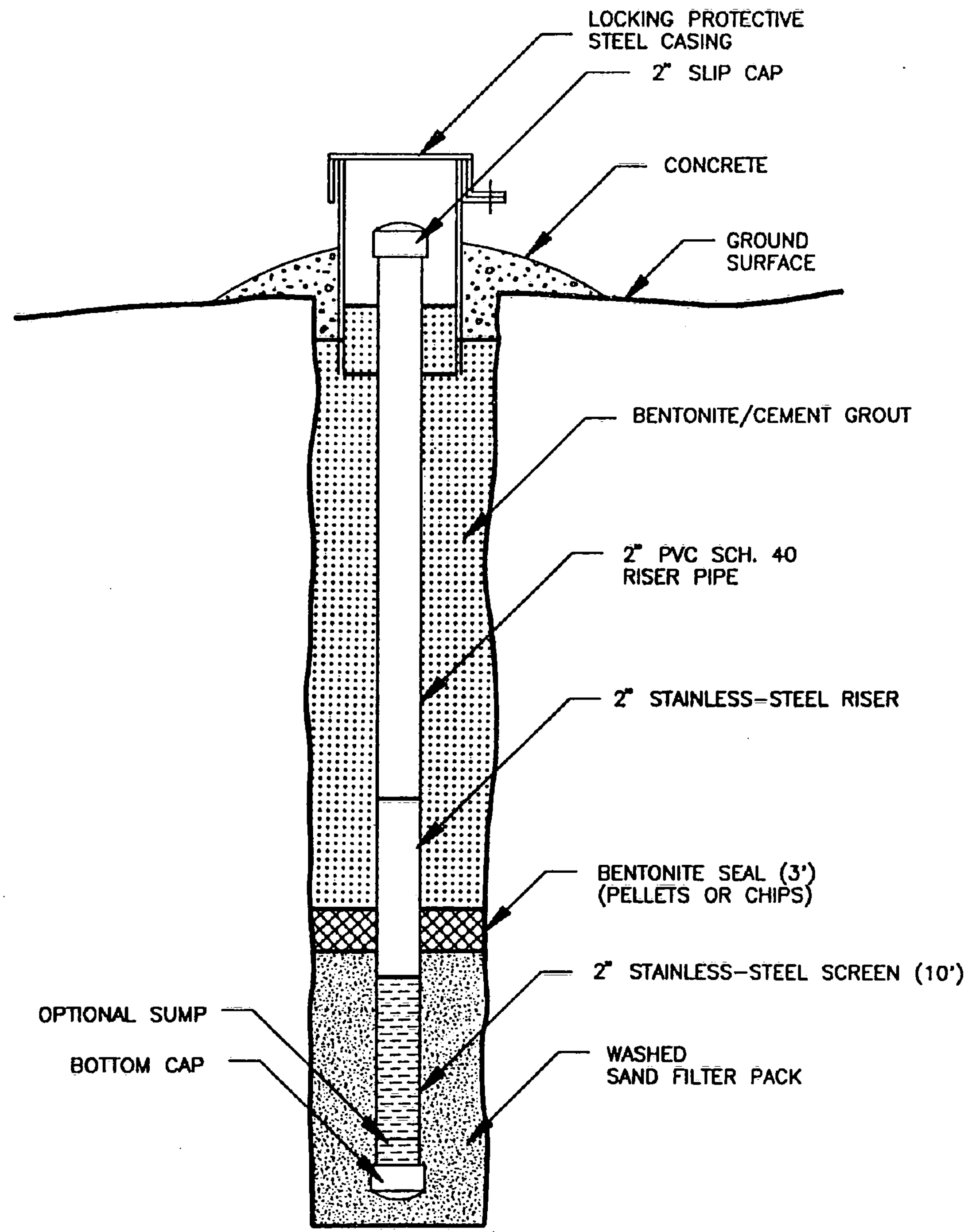
PROPOSED GROUNDWATER SAMPLING/ANALYSIS
PASCO LANDFILL
PASCO, WASHINGTON

Monitoring Well	Groundwater Samples						
	MFS[1]	VOC[2]	SVOC[3]	Pest/PCB[4]	Herbicides[5]	PPM[6]	Radionuclides[7]
5	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X
7	X	X	X	X		X	
8	X	X	X	X	X	X	X
9	X	X	X	X	X	X	X
EE 2	X	X	X	X		X	
EE 3	X	X	X	X	X	X	
EE 4		X	X		X	X	
EE 5		X	X		X	X	
EE 6		X	X	X		X	
EE 7		X	X	X		X	
EE 8		X	X			X	

[1]MFS - Mimimal Functional Standards
[2]VOC - Volatile Organic Compounds — EPA Method 8240
[3]SVOC - Semivolatile Organic Compounds — EPA Method 8270
[4]Pest/PCB - Organochlorine Pesticides/PCBs — EPA Method 8080
[5]Herbicides — EPA Method 8150
[6]PPM - Priority Pollutant Metals — EPA Method 6010
[7]Radionuclides
Gross Alpha-Beta — EPA Method 900.0
Gross Gamma — EPA Method 901.1

Notes:

Well EE 9 has been damaged and can no longer be sampled.
Wells JUB Control and EE 1 have been replaced with MW-21.



NOT TO SCALE

Burlington Environmental Inc.

PASCO LANDFILL
PROPOSED MONITORING WELL
CONSTRUCTION DETAILS

PASCO LANDFILL
PASCO, WASHINGTON
624419

FIGURE 5

REV. DATE	F 7/24/92
DRAWN BY	BB 9/1/92
CHECKED BY	9/1/92
DOCUMENT MANAGER	JW 9/2/92
PROJECT MANAGER	

2.8 EE-9 Well Abandonment

Monitoring Well EE-9 has been out of service for some time and may not be repairable. Therefore, well EE-9 will be inspected, and if it cannot be repaired, will be abandoned in accordance with WAC 173-160. The screened section of the well will be pressure grouted with bentonite and the remaining casing filled to grade with bentonite. In addition, any other wells found to be damaged beyond repair will be recommended for proper abandonment. A determination on the need to replace EE-9 will be made based on the findings from this investigation.

2.9 Monitoring Well Development

After well installation, each new well will be developed by pumping a quantity of water at least equal to the volume of fluid lost during drilling (if water is used) plus at least three times the volume of water in the well screen, riser, and sand pack (assuming a 50-percent void ratio in the sand pack). Prior to development, the static water level at each well will be measured, and floating/immiscible layers will be investigated with an interface probe. Observations on well development will be recorded on the appropriate form. Development will proceed until the discharge is clear, and the pH, specific conductivity, and temperature (measured with field instruments) have stabilized. If the water quality parameters or turbidity of the discharge do not stabilize, development will continue up to the removal of five times the well and sand pack volume or 15 times the well casing, whichever is greater. A two-inch submersible, high-capacity stainless-steel pump (Grundfos Redi-Flo 2) will be used to develop the wells. Development water will be drummed and staged on site. This development water will be disposed of in accordance with the IWMP. Well development tools and equipment will be thoroughly decontaminated prior to use at each well according to the procedures in Section 4.

2.10 Groundwater Sampling/Analysis

To provide samples that are representative of groundwater quality in the vicinity of all site monitoring wells and to provide additional field data relevant to groundwater characterization, the following requirements will be met during groundwater sampling.

1. New wells will be developed and then allowed to stabilize for a minimum of one week prior to purging and sampling. Background wells will be sampled first, followed by new wells and wells of unknown water quality, followed by existing wells known to have elevated levels of contaminants.

2. At least three well volumes will be purged before sample collection (or when pH, specific conductivity, temperature, and turbidity in the purge water have stabilized). Prior to purging of well water, floating/immiscible layers will be investigated via an interface probe. Well purging and water sampling observations and procedures will be documented.

3. The water level will be measured and recorded prior to sampling.

4. Sampling will be conducted using Teflon bailers, a two-inch submersible pump, or the dedicated sampling equipment present in the existing monitoring wells.

5. The groundwater pH, specific conductivity, temperature, and turbidity will be measured and recorded in the field.

6. Addition of chemical preservatives to specific sample containers will be performed in accordance with laboratory requirements outlined in Section 3.

7. One duplicate sample will be collected for every 20 samples collected and each shipment containing VOC samples will include a trip blank.

8. All samples will be cooled using ice or freeze packs in protective coolers to less than 4°C in preparation for delivery to the analytical laboratory.

9. Samples will be shipped or transported to the specified laboratory within 36 hours of sampling.

10. All equipment will be properly decontaminated between samples as described in Section 4.

2.11 Water-Level Measurements

Water levels will be measured in all monitoring wells on an approximate monthly basis during the period of the site characterization field work. That is, three measuring events will be completed for the existing wells and two for the new wells. In addition, either the MW-12 or the MW-17 well cluster will be monitored continuously with appropriate transducers and a data logger for a period of one month. These data will be used to evaluate seasonal variations in water levels that may be due to natural or irrigation effects, and to assess how these variations may influence local groundwater flow directions and flow rates.

Water levels will be measured with an electronic water-level indicator. The indicator tip and cable will be decontaminated between wells according to procedures outlined in Section 4. All pertinent information and unusual conditions will be recorded in the Burlington field geologist's notebook and on the appropriate field forms.

Water-level measurements will first be taken at EE-6 and EE-7. These data will be used to determine if the water table intersects the well screens. If so, moving the location of MW-18 will be considered by Burlington and Ecology.

For the extended monitoring, water levels will be continuously recorded in the shallow, intermediate and deep well of the cluster for a 30-day period. Three transducers linked to a multi-channel data logger will be utilized. Qualified Burlington personnel will monitor this data logger at regular intervals throughout the period to ensure that all equipment is functioning properly. Water levels in each monitored well will be checked daily using an electronic water-level meter to collect backup data and allow for correction of possible transducer drift.

During one round of water-level measurements, the field crew will attempt to measure the existing moisture sensors. Since these sensors were constructed at or below the cell bottom, these measurements may be useful in establishing cell elevations.

2.12 Physical Soil Test Sampling/Testing

To provide data for later fate and transport evaluations and assist in possible remedial systems implementation, selected soil samples will be tested for physical and engineering characteristics. These tests will include sieve analysis, Atterberg limits, hydraulic conductivity, particulate organic carbon content, and cation exchange capacity. Samples will be collected from the Touchet Sand unit from a depth of 30 to 35 feet in proposed Monitoring Wells MW-13 and MW-14. These samples are expected to represent the type of subsurface materials present immediately below the maximum waste burial depth in Zone A. A sample from the Pasco Gravels will also be collected from MW-13. An attempt will be made to collect an undisturbed sample. If this is not possible, the sample will be collected from the auger flights.

Table 5 shows the proposed physical soil tests, sampling methods, and analytical methodology to be used. Samples for sieve analysis, Atterberg limits, organic carbon content, and cation exchange capacity will be transferred from the split-spoon sampler to the appropriate glass jars, sealed, and labelled. Samples for permeability, moisture content, and density will not be disturbed in the field. The three-inch diameter stainless-steel sleeve containing these samples will be waxed on each end, wrapped in tape and packed upright in a cooler for shipment. All physical soil test samples will be submitted to an accredited geotechnical laboratory for testing.

Table 5

PHYSICAL SOIL TESTS - TOUCHET SAND
AND PASCO GRAVEL UNITS

PASCO LANDFILL
PASCO, WASHINGTON

Test Description	Analytical Method Number	Sample Acquisition Method	Sample Size	Unit
Sieve analysis	ASTM D 422	Split-spoon sampler	16 oz.	Pasco, Touchet
Atterberg limits	ASTM D 4318	Split spoon sampler	16 oz.	Touchet
Permeability* - Constant head permeameter or - Backpressure saturated constant head permeameter	ASTM D 2434 ASTM D 5084	Split-spoon with 24" stainless-steel sleeve and sample retainer	24 in.	Pasco, Touchet
Density*	COE EM 1110-2-1906	Split-spoon with 24" stainless-steel sleeve and sample retainer	24 in.	Touchet
Moisture content*	COE Manual 1110-2-1906, Appendix II	Split-spoon with 24" stainless-steel sleeve and sample retainer	24 in.	Touchet
Particulate organic carbon content	ASSTO T267-86	Split-spoon sampler	2 oz.	Pasco, Touchet
Cation exchange capacity	SW-846 9080	Split-spoon sampler	8 oz.	Pasco, Touchet
Porosity	(Calculated)	Split-spoon sampler with 24" stainless-steel sleeve and sample material	24 in.	Pasco

* Samples for permeability, density, and moisture content will be segmented by the testing lab from a single sealed 24-inch, 3-inch diameter stainless-steel sleeve sample.

2.13 Landfill Gas Probe Installation

Nested landfill gas probes will be installed at two locations along the western boundary of the solid waste landfill. These locations are shown in Figure 2. The probes will consist of a single 6-inch-diameter boring with a triple completion of 0.75-inch PVC screens and risers. Soil samples will be collected with a split-spoon sampler at five-foot intervals in order to characterize the geology at each boring. Five-foot screen sections will be placed at depths of 10 to 15 feet, 25 to 30 feet, and 40 to 45 feet to monitor landfill gases. Actual depth of the screened interval may vary in the field based on geologic conditions encountered during drilling of each boring.

Probe installation will follow the guidelines in the Ecology Solid Waste Landfill Design Manual (WADOE #8713, 1987). Each probe will be installed to the proposed depth and then the annulus around the screen backfilled with ¼-inch-diameter pea gravel to the top of the screen. A secondary seal consisting of one foot of No. 8-12 sand, two feet of No. 20-40 sand, and three feet of bentonite slurry will be placed over each probe screen. The bentonite slurry will extend to the base of the next PVC screen. Figure 6 shows a graphic representation of the proposed nested gas probe.

All cuttings generated during probe boring will be drummed and staged on site. Disposal of these cuttings will be conducted in accordance with the IWMP.

2.14 Landfill Gas Sampling/Analysis

Landfill gas samples will be collected from the six new landfill gas probes. Prior to sample collection, landfill gas pressure in each probe will be measured by attaching a pressure gauge to the probe stopcock. Samples will then be collected and analyzed for methane, oxygen, nitrogen, hydrogen, carbon dioxide, hydrogen sulfide, and VOCs. Gas samples will be collected after purging a minimum of one probe volume of air using a gas pump, flow meter, and Teflon tubing attached to the stopcock on the casing head. Samples for VOC analysis (Method 8240) will be collected in a Tedlar bag or glass sample bulb. Samples for the other gasses will be collected in the same manner. Gas samples will be stored in coolers at 4°C and immediately shipped to the analytical laboratory. Chain-of-custody will conform to procedures outlined in Section 3.4.

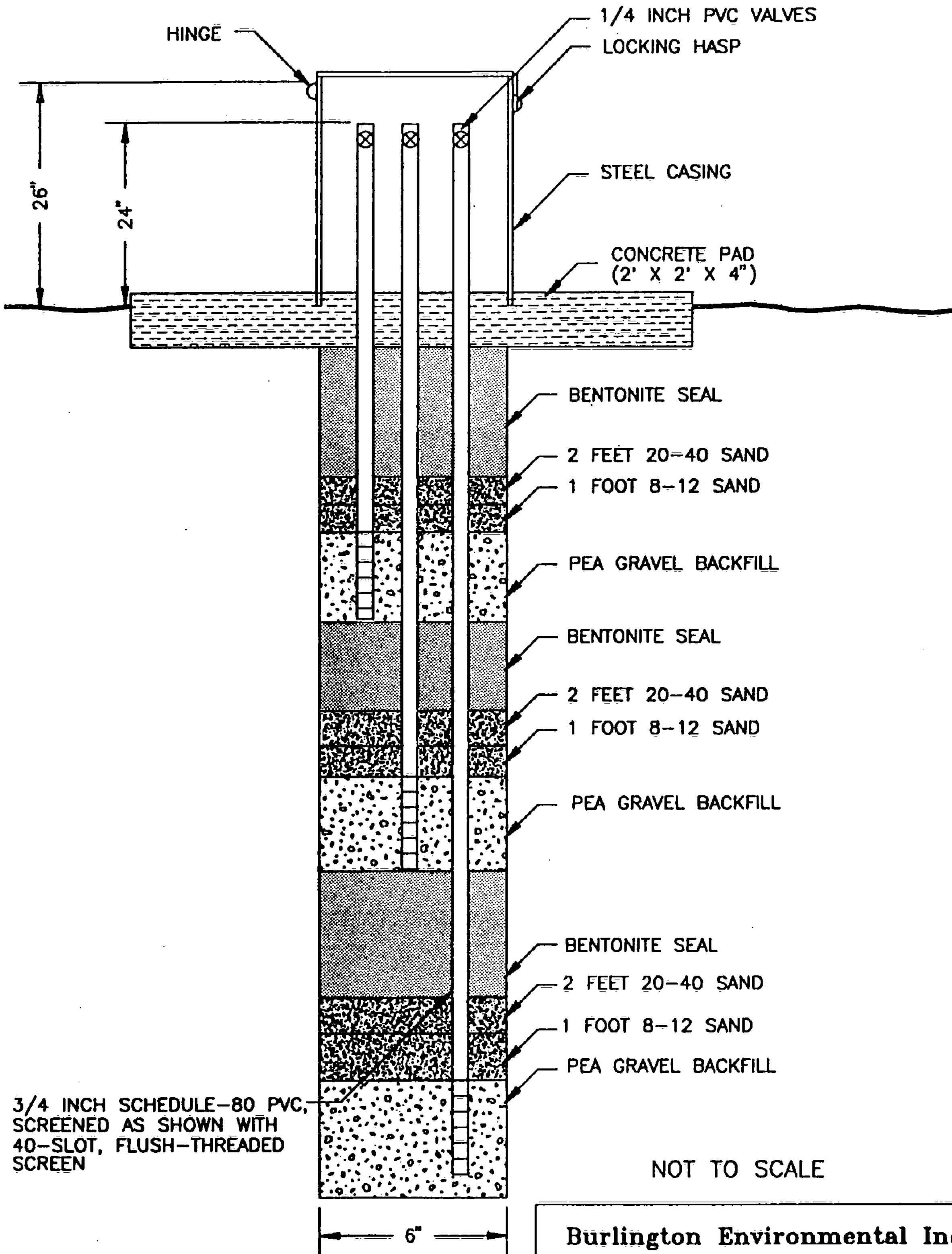
During field operations, all existing landfill gas probes will be measured monthly for combustible gasses. This will be accomplished by inserting a sampling tube into the probe port and pumping a sample through a combustible gas meter until a constant maximum reading is obtained.

2.15 Aquifer Pumping Test

A pumping test is planned for the proposed Monitoring Well MW-15. The proposed location of this well is adjacent to Well MW-5 (according to information available from Technico Environmental Services (1991), MW-5 is not currently impacted by the facility). This well will be located more than 400 feet north of the estimated VOC plume boundary to minimize the potential of affecting the plume or for pumping contaminated water to the surface during the test. Prior to the pumping test, water samples will be collected from MW-15 and analyzed for the parameters shown on Table 4.

Preliminary calculations indicate that the well's capture zone will extend approximately 50 feet south of the pumping well, thus indicating that the plume will not be intercepted during pumping. The modeling assumed a hydraulic conductivity of 1,000 feet/day, a saturated thickness of 25 feet, a pumping rate of 100 gallons per minute (gpm), and a southwest gradient of 0.0027. These assumptions are based on published values for the Pasco Gravels and data from previous site investigations.

Well MW-15 will be pumped at a maximum rate of approximately 100 gpm for 72-hours. Water levels will be continuously recorded in MW-15 and observation well MW-5 (see Figure 2) during the test using transducers and data loggers. At the end of 72 hours, pumping



NOT TO SCALE

Burlington Environmental Inc.

CONSTRUCTION DETAILS
PROPOSED LANDFILL GAS PROBE

PASCO LANDFILL PASCO, WASHINGTON 624419	FIGURE 6

DRAWN BY BB 9/1/92
CHECKED BY 9/1/92
DOCUMENT MANAGER 9/2/92
PROJECT MANAGER 9/1/92
G REV. DATE 7/24/92

will be discontinued and recovering water levels will be measured in both MW-15 and MW-5 for a 72-hour recovery period. In addition, the water level in Well 3 will be measured every six hours during pumping and recovery periods using an electronic water-level meter.

Qualified personnel will monitor the data loggers at regular intervals throughout the period to evaluate whether the equipment is functioning properly. Water levels in MW-15 and MW-5 will also be measured every six hours with the electronic water-level indicator to collect backup data and allow correction of possible transducer drift.

The water recovered from this pump test is not expected to contain significant levels of contaminants and should meet the requirements for surface discharge per WAC 173-200. Burlington will monitor specific conductance of the discharged water every six hours during pumping to evaluate whether the quality of discharge water is stable. Surface discharge is planned in the area west of well MW-4 using a commercial irrigation sprinkler to increase evaporation and minimize ponding of pumping test water.

Details of the planned surface discharge procedures are outlined in the IWMP. These will be submitted under separate cover to Ecology, along with the preliminary modeling data and the analytical results from MW-15. Burlington anticipates that these submittals will be adequate to satisfy the evaluation of impact requirements in WAC 173-200-080. If approval of surface discharge is denied by Ecology, Burlington will re-evaluate the pumping test and possible water disposal options.

2.16 Well Surveying

All existing and new monitoring wells and landfill gas probes will be surveyed by a registered surveyor. Both vertical and horizontal surveys will be conducted from permanent benchmarks established during mobilization and site setup. The vertical survey will utilize the National Geodetic Vertical Datum of 1929. The top of the well casing, the top of the riser, and the ground surface will be surveyed to the nearest 0.01 foot, and a mark will be placed on the casing indicating the location that was surveyed. Landfill gas probes will be surveyed for horizontal position only. Horizontal locations will be surveyed to the nearest 0.1 foot. The abandoned soil borings (staked after abandonment) will also be surveyed for vertical and horizontal location.

2.17 Assessment of Potential Ambient Air Contaminants

A preliminary assessment of potential ambient air contaminants at the site will include analysis of shallow soil-gas samples and analysis of surficial and shallow soil samples (see Section 2.5). Assessment of potential ambient air VOC concentrations will be completed through collection and analysis of shallow soil-gas samples. Ten shallow soil-gas samples will be collected from a depth of five feet at selected areas of the site using Burlington's RECON System. Sample site selection will include two samples, each immediately adjacent to Zone A, Zone D, the Burn/Balefill Area, and the Sanitary Landfill (see Figure 2). Sample collection and handling procedures will follow the guidelines for soil-gas sampling in Section 2.4. Samples will be analyzed for VOCs by SW-846 Method 8240.

After interpretation of the shallow soil-gas data, and the surface and shallow soil data to be collected in this investigation, a summary of potential ambient air contaminants at the site will be prepared and included in the Phase I RI report. If contaminants are identified which could be incorporated into the ambient air at levels of concern, an ambient air monitoring program would be warranted as part of a future investigative phase. The sample collection and analytical methods proposed for the ambient air monitoring program would be contaminant-specific. For organic contaminants of concern, the program would conform to the USEPA sampling and analytical methods as defined in the Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air (EPA/600/4-89/017, 1988).

3 SAMPLE HANDLING AND DOCUMENTATION PROCEDURES

This section outlines the requirements for sample identification, labelling, preservation, and handling. Field and sample documentation and chain-of-custody and sample shipping procedures are also covered in this section.

3.1 Sample Identification and Labelling

Each sample will be assigned a unique sample identification code. The alphanumeric code will contain sufficient information to identify the overall site location, and the sample medium (groundwater, soil, or soil-gas). The code will consist of three alphanumeric strings separated by two hyphens. The first string will consist of the three letters "PLF" to designate the Pasco Landfill as the overall site location. The following two alphanumeric strings will identify the sample medium and sample sequence number. For instance, the code "PLF-GW-001" designates groundwater sample number 1. The codes "PLF-SS-003", "PLF-SBS-004", and "PLF-SG-001" designate surface soil sample number 3, subsurface soil sample number 4, and soil-gas sample number 1, respectively. Duplicate samples will be given sequential numbers. As an example, if two groundwater samples are collected from the same monitoring well (and the previously collected groundwater sample was identified as PLF-GW-005), the samples would be identified as PLF-GW-006 and -007. The analytical laboratory will not be informed of which samples are duplicates.

All sample containers will be affixed with a label to prevent misidentification of samples. The label will include, at a minimum, the following:

- initials of collector;
- date and time of collection;

- location;
- sample identification code;
- analyses; and
- preservatives.

Blind-sample labels and actual sample locations will be recorded on the Sample Control Sheet (see QAPP). For subsurface soils, sample location information will include boring or monitoring well number and sample depth. Surface and near-surface soil sample location information will include a sketch, as needed, and sample depth. Composite or discrete sample types will be denoted. All duplicate samples will be identified with the corresponding original sample also identified on the Sample Control Sheet. Sample identification forms will not be sent to the laboratory. When each sample is received at the laboratory, it will be checked and recorded on the chain-of-custody form.

3.2 Sample Preservation and Handling

Sample containers, preservatives, and holding times for constituents to be tested are listed in Table 6. Measurements of pH and specific conductance will be taken in the field on unpreserved water samples. Water samples to be submitted for dissolved metals analysis will be preserved in the field. Samples for metals from the shallow wells (screened in the Pasco Gravels) will be unfiltered. Both filtered and unfiltered samples will be collected for analysis of metals from the intermediate and deep wells (screened in the Ringold Gravels). Water samples for volatile organic analyses will be unfiltered and unpreserved.

All sample bottles will be supplied by the analytical laboratories for each sampling event and will include the appropriate preservatives. No chemical preservative will be needed for soils. Soil samples will be placed in bottles supplied by the laboratory and kept refrigerated.

Table 6

SAMPLE CONTAINERS AND PRESERVATION

PASCO LANDFILL
PASCO, WASHINGTON

Matrix	Parameter	Container Type	Preservation and Handling	Holding Time
Soil-Gas	Volatile Organics	500-ml. Tedlar bag or evacuated lined bottle	Fill, minimize air entry to sample; store in dark; cool to 4°C	14 days
Soil	Volatile Organics	Two 2-oz. glass jars; PTFE*-lined silicon cap	Fill, minimize air space; store in dark; cool to 4°C	14 days
	Semivolatile Organics	8-oz. glass jar; PTFE-lined lids	Cool to 4°C	7 days to extract
	Pesticides/PCBs	8-oz. glass; PTFE-lined cap	Cool to 4°C	7 days to extract
	Herbicides	8-oz. glass; PTFE-lined cap	Cool to 4°C	7 days to extract
	Dioxin	8-oz. glass; PTFE-lined lids	Cool to 4°C	30 days
	Gross Alpha & Beta	8 oz. HDPE**	---	None
	Gross Gamma	8 oz. HDPE	---	None
	PPM Metals	8-oz. glass	Cool to 4°C	6 months
	Organic Carbon	2-oz. glass; PTFE-lined cap	Cool to 4°C	28 days
	Cation Exchange Capacity	8-oz. glass jar	---	---
Water	MFS - COD, TOC, Ammonia	500 ml HDPE	H_2SO_4 to pH <2, cool to 4°C	28 days
	MFS - Coliform	120 ml HDPE	.008% $NA_2S_2O_3$, cool to 4°C	6 hours
	MFS - Nitrate, Nitrite	250 ml HDPE	Cool to 4°C	48 hours
	MFS - Conductance, Chloride, Sulfate, Fe, Zn, Mn	500 ML HDPE	Cool to 4°C	28 days
	Volatile Organics	Two 40-ml glass vials; PTFE-lined silicon septum caps	Fill, leaving no air space; store in dark; cool to 4°C	14 days
	Semivolatile Organics	1-liter amber glass; PTFE-lined cap	Cool to 4°C	7 days to extract
	Pesticides/PCBs	1-liter amber glass; PTFE-lined cap	Cool to 4°C	7 days to extract
	Herbicides	1-liter amber glass; cool to 4°C	Cool to 4°C	7 days to extract
	Gross Alpha & Beta	2 liter HDPE	HNO_3 to pH <2	6 months
	Gross Gamma	2 liter HDPE	HNO_3 to pH <2	6 months
	PPM Metals	1-liter HDPE	Shallow wells - unfiltered Intermediate and deep wells - filtered and unfiltered HNO_3 to pH <2; Cool to 4°C	6 months

NOTE:

*PTFE = polytetrafluoroethylene (Teflon)
**HDPE = High Density Polyethylene

Sample bottles will be placed in insulated coolers packed with ice to cool them to approximately 4°C and packing material to prevent breakage during transport. The coolers will then be shipped or transported directly to the analytical laboratory following the chain-of-custody procedures outlined in Section 3.4.

3.3 Field and Sample Documentation

Information pertinent to the work performed will be recorded in logbooks and on field forms for sampling events and daily activities. Documentation by Burlington will be stored in the Burlington project file at the Seattle, Washington, office at the completion of field work. Field forms included in the QAPP are anticipated to be used and are listed on Table 7.

All information pertinent to a field survey and/or sampling will be recorded in a field logbook (or series of logbooks) during performance of that activity. The field logbook will be a bound book that has consecutively numbered pages and will be suitable for submission as evidence in legal proceedings. Field logbooks will be completed so that later modifications or additions should not be necessary. These will become a part of the project file for the site investigation.

Entries in the field logbook(s) will contain three basic categories of information including, but not limited to:

- site activities;
- photo/survey data; and
- sampling data.

Site activity entries will be completed daily to record all relevant site investigation information. The photograph/survey and sampling logs will be completed on an "as-performed" basis.

Table 7

FIELD FORMS

PASCO LANDFILL
PASCO, WASHINGTON

1. Sample Control Log
2. Soil/Sediment Sampling
3. Record of Subsurface Exploration
4. Test Pit Log
5. Water Sampling Data
6. Well Completion Report
7. Well Development and Purging General Data
8. Water Level Data
9. Daily Activities Log
10. Site Visitor Log Sheet
11. Photograph Log
12. Site Supervisor's Daily Report
13. Chain-of-Custody Record
14. Field Logbook
15. Record of Conversation
16. Field Project Debriefing Form
17. Site Exit Checklist
18. Drum Log
19. Record of Grouting
20. General Sampling Log
21. Test Pit Log
22. Lagoon Liquid/Sludge Log
23. RECON® Sampling Worksheet
24. RECON® Parameter Setup Sheet
25. RECON® Sample Analysis Worksheet
26. RECON® Data Summary Table
27. Hydrogeologic Pump Test Data
28. Totalizer Count
29. Direct Reading Instrument and Air Monitoring Data Sheet

The field logbook will be kept throughout the field sampling operations to document relevant information concerning sample generation, sample preparation, and field data. All well development/flushing data, as well as sampling activities and data, will be recorded on specified forms (provided weather conditions are suitable) and filed in a three-ring binder. If precipitation occurs, information will be recorded in the field logbook and then transferred to the forms at a later time.

One field audit will be performed by QC personnel to audit the field documentation. The audit will be unscheduled and unannounced to field personnel. Corrective action will be implemented if necessary. The field audit checklist is provided in Appendix E of the QAPP.

3.4 Chain-of-Custody Procedures

A serially numbered chain-of-custody (COC) is initiated at the time of sampling. An example COC Record/Analysis Request form is in the QAPP. It contains the sample number, date and time of sampling, the name of the sampler, and the laboratory analysis requests. Each record will be signed by all who handle sample containers. Sample transfers will be noted on the record sheet for each sample. Upon receipt of samples at the laboratory, the sample container will be examined and the condition of the samples will be recorded by lab personnel. The COC procedures will document sample transfer, sample possession, and sample integrity from collection through analysis.

Custody seals shall be used to seal each sample container prior to sample packaging in ice chests. Sample transport ice chests shall also be sealed after packing prior to transfer to the sample transportation agent. Sampling personnel will place a signed and dated custody seal across the opening points (minimum of one) of the containers.

3.5 Sample Shipping Procedures

Samples will be transported by a next-day delivery service to the laboratory for chemical analysis. The samples will be accompanied by the COC record. All samples will be delivered to the person in the laboratory authorized to receive samples (sample custodian).

When a sample set is picked up by the delivery service, it will be packaged in a proper shipping container to avoid leakage and/or breakage. The shipping container will also be labelled and packaged in accordance with Department of Transportation regulations. Packing and shipping will conform to the following protocol.

1. Sample container lids will be secured with packing tape.

2. For liquid samples, volume levels will be marked on the bottle using an indelible marker.

3. Approximately three inches of inert cushioning material will be placed in the bottom of the cooler.

4. Containers will be placed in the cooler so that they do not touch each other.

5. VOC vials will be placed in a sealable plastic bag and will be positioned in the center of the cooler.

6. Samples will be packed in freeze packs or in ice, enclosed in double plastic bags.

7. The blank samples will be packaged with the collection samples that they control.

8. The cooler will be filled with cushioning material.

9. Paperwork will be placed in plastic bags and securely taped to the inside lid of the cooler.

10. The cooler drain will be taped shut, if one is present.

11. The cooler will be wrapped completely with strapping tape at two points without covering any labels.

12. The laboratory address will be affixed to the top of the cooler.

13. "This Side Up" labels will be affixed on all four sides and "Fragile" labels will be affixed on at least two sides.

When a sample set is picked up by the delivery service, the shipper will receive a copy of the shipping documentation. This documentation will be placed in the project file at the Burlington office.

Upon receipt of the shipping container, the laboratory will inspect the custody seal for its integrity. The chest will be opened and the shipment checked versus the COC. Any inconsistencies or problems with a sample shipment (such as breakage) will be reported to the QA/QC Coordinator for immediate resolution.

When any/all problems are resolved, the corrective action will be documented. The official custody of the samples will be accepted by the laboratory by signing the COC. The samples will then be tracked through the laboratory by internal custody procedures.

4 FIELD EQUIPMENT DECONTAMINATION PROCEDURES

Equipment and material contacting potentially-contaminated material or the sample medium will be discarded properly after use and replaced or decontaminated in accordance with procedures listed below. Materials to be discarded, including decontamination solutions, will be handled according to the IWMP.

The following procedure will be used for decontaminating stainless-steel equipment, including split-spoon samplers, and PTFE (Teflon) equipment.

1. Wash thoroughly with nonphosphate detergent in hot water.
2. Rinse several times with tap water.
3. Rinse several times with distilled water. For bailers, follow with deionized rinse.
4. Rinse once with acetone.
5. Rinse once with pesticide-grade hexane.
6. Air dry in an area removed from cross-contamination.
7. Cap or cover after drying. Applicable equipment will be wrapped in aluminum foil and then placed in plastic bags.

The following procedure will be used for decontaminating safety equipment such as respirators, boots, and gloves.

1. Brush off loose dirt with soft bristle brush or cloth.
2. Rinse thoroughly with tap water.
3. Wash in nonphosphate detergent in warm water.
4. Rinse thoroughly with tap water.

5. Rinse thoroughly with distilled water.

6. Air dry in dust-free environment; keep articles out of the sun.

7. Store in plastic bag.

The following procedure will be used for decontaminating ancillary equipment such as ropes, extension cords, generators, hand carts, and field sampling equipment to be returned to the laboratory for decontamination.

1. Brush off loose dirt with stiff bristle brush.

2. Rinse off with high-pressure water.

3. Air dry.

The following procedure will be used for field decontamination of pumps.

1. Submerge pump intake in a nonphosphate detergent solution.

2. Operate pump for a minimum of ten minutes. Recycle the soap solution to a wash basin through an entire length of hose when the hose must be reused.

3. Clean all exterior surfaces of both tubing and pump with bristle brush and clean cloth.

4. Submerge pump intake in tap water.

5. Operate pump for a minimum of ten minutes. Recycle the water to rinse basin through an entire length of hose.

6. Submerge pump intake in distilled water.

7. Pump the distilled water to the rinse basin for disposal (do not recycle distilled water).

8. Repeat steps 6 and 7 with a fresh supply of distilled water.

9. Repeat steps 6 and 7 with deionized water.

10. Place pump and hose on rack to air dry.

11. Wrap pump and hose in aluminum foil and then place the equipment in a plastic bag. Seal bag and place a label on the bag indicating date of decontamination.

The following procedure will be used for field decontamination of compositing containers.

1. Scrub both inside and outside surfaces of container with nonphosphate detergent solution using a bristle brush.

2. Rinse several times with tap water.

3. Rinse once with hexane.

4. Rinse several times with distilled water.

5. Place on drying rack and allow to air dry.

6. Place in plastic bag, seal, and label with date of decontamination.

For the drilling rig, augers, and backhoe, decontamination will be performed with a steam cleaner between zones and between borehole locations.

The procedures for decontamination of personnel are presented in the site Health and Safety Plan.

5 FIELD INVESTIGATION SCHEDULE

Some initial fieldwork began at the site in September 1992. A majority of the field investigations will commence within 15 days of final approval of the Work Plan by Ecology. The major field work tasks are expected to be completed approximately 13 weeks after final approval of the Work Plan.

REFERENCES

Driscoll, F.G. 1986. Groundwater and Wells. Johnson Division, St. Paul, Minnesota.

Gilbert, R.O. and Simpson, Jeanne C. February 1990. Statistical Sampling and Analyses Issues and Needs for Testing Attainment of Background-Based Cleanup Standards of Superfund Sites, presented at the USEPA Workshop on Superfund Hazardous Waste.

Technico Environmental Services. 1991. Pasco Sanitary Landfill Permit Application and Supporting Documentation Showing Compliance with WAC 173-304, prepared for Pasco Sanitary Landfill.

U.S. Environmental Protection Agency. June 1988. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. USEPA/600/4-89/017.

______. October 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. USEPA/540/G-89/004

______. 1987. A Compendium of Superfund Field Operations Methods. Vols 1 and 2. Office of Emergency and Remedial Response. USEPA/540/P-87/001a.

QAPP

Phase I Remedial Investigation
Pasco Landfill
Pasco, Washington

Volume II - Sampling and Analysis Plan

Part 2 - Quality Assurance Project Plan

November 1992

Prepared for:

Pasco Landfill PLP Group

Project 624419

Prepared by:

BURLINGTON ENVIRONMENTAL INC.
Technical Services Division
7440 West Marginal Way South
Seattle, Washington 98108-4141
(206) 767-3306

Printed on recycled paper

ABSTRACT

The Phase I Remedial Investigation Work Plan for the Pasco Landfill in Pasco, Washington describes the various steps or phases essential to the investigation process and defines the activities that will be conducted during this investigation. This Phase I Remedial Investigation will be completed under an Agreed Order with the Washington Department of Ecology (Order No. DE92TC-E105) and in compliance with the Model Toxics Control Act (Chapter 70.105D RCW and Chapter 173-340 WAC). Because the Pasco Landfill site is on the National Priority List, the Phase I Remedial Investigation will also be conducted in a manner consistent with the National Contingency Plan (40 CFR Part 300).

The objective of this investigation is to gain additional information on the nature and extent of contamination in the air, soil, and groundwater near potential contaminant sources at the Pasco Landfill. A Preliminary Risk Assessment will also be completed. This Work Plan describes the various steps proposed for gathering the necessary site characterization information and data and for performing the Preliminary Risk Assessment.

As part of the Work Plan (Volume I), a Sampling and Analysis Plan (Volume II), a Data Management Plan (Volume III), a Health and Safety Plan (Volume IV), and a Public Participation Plan (Volume V) have been developed for the performance of this project. Completion of the work defined in these planning documents will be followed by a Phase II Remedial Investigation (if necessary) and a Feasibility Study. The Washington Department of Ecology will ascertain the need for additional remedial investigation activities and the scope of the Feasibility Study based on the findings from the Phase I Remedial Investigation. Following the Feasibility Study, any need for remedial action will be determined by the Washington Department of Ecology.

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*Appendices bound separately

1 APPROVAL OF QUALITY ASSURANCE PROJECT PLAN FOR SAMPLING AND ANALYTICAL SUPPORT

Project Title:	Phase I Remedial Investigation of the Pasco Landfill, Pasco, Washington
Pasco Landfill PLP Group Project Coordinator:	Ms. Marlys Palumbo
Burlington Environmental Inc. Technical Coordinator and Project Manager:	Mr. Dave Haddock
Performing Organization:	BURLINGTON ENVIRONMENTAL INC. Technical Services Division 7440 West Marginal Way South Seattle, Washington 98108-4141
Duration:	3rd quarter 1993
Type of Project:	Phase I Remedial Investigation
Supporting Organizations:	Barringer Laboratories, Inc. Core Laboratories Enseco-California Analytical Laboratory Sound Analytical Services

APPROVAL:

Name: David R. Haddock	Name:
Title: Operations Manager	Title: Quality Assurance Officer
Signature: David R. Haddock	Signature:
Date: 10/23/92	Date:

Name: Kathleen A. Blaine	Name:
Title: Analytical QC Coordinator	Title: Field QC Coordinator
Signature: Kathleen A. Blaine	Signature:
Date: 10/29/92	Date:

2 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) was prepared by Burlington Environmental Inc. (Burlington) as part of the Phase I Remedial Investigation (RI) Field Sampling Plan for the Pasco Landfill in Pasco, Washington.

The project description, the site history, a facility description, a summary of the previous studies, and the scope of work are described in the project Work Plan.

The sampling/analysis program will adhere to techniques and Quality Assurance/Quality Control (QA/QC) procedures as described in this QAPP that will be defensible to the State of Washington Department of Ecology (Ecology).

This QAPP describes the procedures to be used for collection of samples, their analyses, and the associated measures taken to document the quality of work to be performed in this project.

3 PROJECT ORGANIZATION AND RESPONSIBILITY

The following organizations and individuals have key roles in the QC of this project. These individuals will manage the project in accordance with this QAPP.

Washington Department of Ecology	
Project Coordinator	Guy Gregory
Pasco Landfill PLP Group	
Project Coordinator	Marlys Palumbo
Burlington Environmental Inc.	
Project Manager	Dave Haddock
Assistant Project Manager	Ted Wall
RI Task Manager	Don Robbins/William (Chip) V. Goodhue
Site Manager	Craig Maxeiner
Assistant Site Manager	William (Chip) V. Goodhue
Quality Control	Kathleen Blaine

The analytical laboratory services required in this project will be performed by the laboratories listed in Table 1. Table 2 gives the contacts and addresses for these laboratories. For each laboratory, the General Manager or Lab Director will be responsible for all analytical data reports to be accompanied by cognate QA/QC reports.

Table 1

LABORATORIES PERFORMING CHEMICAL ANALYSES

PASCO LANDFILL
PASCO, WASHINGTON

ANALYSIS	MATRIX	LABORATORY
MFS	groundwater	Benton/Franklin County Health District Sound Analytical Services
VOC	groundwater, soil, soil-gas	Sound Analytical Services
SVOC	groundwater, soil	Sound Analytical Services
	air	Enseco-California Analytical Laboratory
Pesticides/PCBs	groundwater, soil	Sound Analytical Services
	air	Enseco-California Analytical Laboratory
Herbicides	groundwater, soil	Sound Analytical Services
	air	Enseco-California Analytical Laboratory
PPM	groundwater, soil	Sound Analytical Services
	air	Enseco-California Analytical Laboratory
Dioxin	soil	Enseco-California Analytical Laboratory
Radionuclides	groundwater, soil	Barringer Laboratories, Inc.
O_2, N, H, CO_2, H_2S, CH_4	landfill gas	Core Laboratories

MFS - Minimum Functional Standards
VOC - Volatile Organic Compounds
SVOC - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls
PPM - Priority Pollutant Metals

Table 2

LABORATORY CONTACTS AND ADDRESSES

PASCO LANDFILL
PASCO, WASHINGTON

Laboratory	Contact/Position	Address/Phone
Barringer Laboratories, Inc.	Dave Lasher Laboratory Director	15000 West 6th Avenue, Suite 300 Golden, Colorado 80401 (303) 277-1687
Core Laboratories	David A. McWharter Laboratory Supervisor	1300 South Potomac Street, Suite 130 Aurora, Colorado 80012 (303) 751-1784
Enseco-California Analytical Laboratory	Michael J. Miille General Manager	2544 Industrial Boulevard West Sacramento, California 95691 (916) 372-1393
Sound Analytical Services	Dennis Bean Laboratory Director	4813 Pacific Highway East Tacoma, Washington 98424 (206) 922-2310
Benton/Franklin Health District	David Miller Laboratory Supervisor	506 McKenzie Street Richland, Washington 99352 (509) 943-2614

4 DATA QUALITY OBJECTIVES

The data requirements for both the Phase I RI site characterization and the Preliminary Risk Assessment are summarized in this section. These data requirements were identified through the development of Data Quality Objectives (DQOs). DQOs are qualitative and quantitative statements specified to ensure that the data generated in this Phase I RI are of known and appropriate quality. The U.S. Environmental Protection Agency (EPA) Data Quality Objectives for Remedial Response Activities (EPA/540/G-87/003 and 004) and the Ecology Guidelines and Specifications for Preparing Quality Assurance Project Plans (91-16, 1991) guidance documents, were used in the development this QAPP and the DQOs for this project. Following the guidance, DQOs are specified for each major data collection activity and are developed using the following three- stage process:

- Stage 1 - identify decision types;
- Stage 2 - identify data uses and needs; and
- Stage 3 - design the data collection program.

In consideration of the decision-making process, the PLP Group, Ecology, and the public have been identified as data users. Phase I RI objectives and corresponding activities have been developed based on the present understanding of the site and current data needs. These objectives are summarized in Table 3.

Table 4 is a summary of the DQOs. This table outlines for each medium the data priority uses, analytical QA/QC levels, and other related factors. The remainder of this QAPP provides backup to Table 4 as well as additional information on QA/QC protocols.

Tables 5 and 6 provide a comparison of analytical method quantitation limits to be used in this Phase I RI to various cleanup criteria. Those compounds for which the specified quantitation limit exceeds one or more cleanup criteria have been identified. For this Phase I RI, the standard analytical methods specified will be used without modification. This approach

Table 3

GENERAL PHASE I REMEDIAL INVESTIGATION OBJECTIVES

PASCO LANDFILL
PASCO, WASHINGTON

Objective	RI Activity
- Identify presence or absence of contaminants.	- Establish presence/absence of contaminants at source and in pathways.
- Identify types of contaminants.	- Establish "nature" of contaminants at source and in pathways.
- Identify concentrations of contaminants.	- Establish concentration gradients.
- Identify mechanism of contaminant release to pathways.	- Establish mechanics of source/pathway(s) interface.
- Identify direction of pathway(s) transport.	- Establish pathway(s)/transport route(s). Identify potential receptor(s).
- Identify environmental/public health factors.	- Establish routes of exposure and environmental and public health threat.

Table 4

DATA QUALITY OBJECTIVES SUMMARY

PASCO LANDFILL
PASCO, WASHINGTON

Activity	SOIL			GROUNDWATER		AIR	
	Background Sample	Surface Sample	Subsurface Sample	Background Sample	Well Sample	Soil-Gas Sample	Landfill Gas Sample
Data Use Priority	- Site character. - Risk assessment	- Site character. - Risk assessment - Evaluation of alternatives - Engineering design of remedial action - Monitoring during implementation of remedial action	- Site character. - Risk assessment - Evaluation of alternatives - Engineering design of remedial action - Monitoring during implementation of remedial action	- Site character. - Risk assessment - Engineering design of remedial action	- Site character. - Risk assessment - Evaluation of alternatives - Engineering design of remedial action - Monitoring during implementation of remedial action	- Site character. - Risk assessment - Monitoring during implementation of remedial action	- Site character. - Risk assessment - Evaluation of alternatives - Engineering design of remedial action - Monitoring during implementation of remedial action
Analytical Levels[1,2]	I, III, IV	III, IV	III, IV	I, III, IV	I, III, IV	II, IV	I, IV

[1]Analytical descriptions per EPA (modified):

I: Field screening or analysis using portable instruments;
II. Field analyses using sophisticated portable analytical instruments; may be in a mobile laboratory on site;
III. All analyses performed in an off-site analytical laboratory. The laboratory may or may not be in Contract Laboratory Program (CLP);
IV. All analyses are preformed in an off-site analytical laboratory following CLP protocols.

[2]Any non-CLP parameters will be analyzed at a level consistent with the CLP QC guidelines. CLP-equivalent data packages will be provided by the analytical laboratory.

[3]Contaminants of Concern: <u>VOC</u>: Volatile Organic Compounds <u>SVOC</u>: Semivolatile Organic Compounds; <u>Pest/PCBs</u>: Organochlorine pesticides/PCBs; <u>PPM</u>: Priority Pollutant Metals; <u>Radionuclides</u>: Gross Alpha-Beta, Gross Gamma; <u>MFS</u>: Minimum Functional Standards.

[4]VOCs under investigation are chloroform, 1,1-DCA, 1,1-DCE, Trans-1,2-DCE, 1,1,1-TCA, PCE, TCE, and Toluene.

Table 4, Continued

DATA QUALITY OBJECTIVES SUMMARY

PASCO LANDFILL
PASCO, WASHINGTON

Activity	SOIL			GROUNDWATER		AIR	
	Background Sample	Surface Sample	Subsurface Sample	Background Sample	Well Sample	Soil-Gas Sample	Landfill Gas Sample
Contamination of Concern[3]	1. Pest/PCBs 2. Herbicides 3. PPM 4. Radionuclides	1. SVOC 2. Pest/PCBs 3. Herbicides 4. PPM 5. Radionuclides	1. VOC 2. SVOC 3. Pest/PCBs 4. Herbicides 5. Dioxin 6. PPM 7. Radionuclides	1. MFS 2. VOC 3. SVOC 4. Pest/PCBs 5. Herbicides 6. PPM 7. Radionuclides	Same as Background	1. VOC[4]	1. Methane 2. Oxygen 3. Nitrogen 4. Hydrogen 5. Carbon dioxide 6. Hydrogen sulfide 7. VOC 8. Gas pressure
Level of Concern	mg/kg - ug/kg ppm - ppb	ug/kg ppb	ug/kg ppb	mg/L - ug/L ppm - ppb	ug/L ppb	mg/L ppm	mg/L - ug/L ppm - ppb
Critical Samples	Critical samples are all samples analyzed using Level IV protocols						

[1]Analytical descriptions per EPA (modified):

I: Field screening or analysis using portable instruments;
II. Field analyses using sophisticated portable analytical instruments; may be in a mobile laboratory on site;
III. All analyses performed in an off-site analytical laboratory. The laboratory may or may not be in Contract Laboratory Program (CLP);
IV. All analyses are preformed in an off-site analytical laboratory following CLP protocols.

[2]Any non-CLP parameters will be analyzed at a level consistent with the CLP QC guidelines. CLP-equivalent data packages will be provided by the analytical laboratory.

[3]Contaminants of Concern: VOC: Volatile Organic Compounds SVOC: Semivolatile Organic Compounds; Pest/PCBs: Organochlorine pesticides/PCBs; PPM: Priority Pollutant Metals; Radionuclides: Gross Alpha-Beta, Gross Gamma; MFS: Minimum Functional Standards.

[4]VOCs under investigation are chloroform, 1,1-DCA, 1,1-DCE, Trans-1,2-DCE, 1,1,1-TCA, PCE, TCE, and Toluene.

Table 5

SOIL CLEANUP LEVELS AND QUANTITATION LIMITS

MTCA = Model Toxics Control Act PARAMETER	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/kg)	MTCA Method A (ug/kg)	MTCA Method A (Industrial) (ug/kg)	MTCA Method B Non-Carcinogen (ug/kg)	MTCA Method B Carcinogen (ug/kg)	Exceed-ance
VOLATILES							
1,1,1-Trichloroethane	71-55-6	10	20,000	20,000	7,200,000		
1,1,2,2 Tetrachlorethane	79-34-5	10				5,000	
1,1,2-Trichloroethane	79-00-5	10			320,000	17,500	
1,1-Dichloroethane	75-34-3	10			8,000,000	11,000	
1,1-Dichloroethylene	75-35-4	10			720,000	1,670	
1,2-Dichloroethane	107-06-2	10				11,000	
1,2-Dichloroethene (total)	540-59-0	10					
1,2-Dichloropropane	78-87-5	10			1,470	14,700	
2-Butanone (MEK)	78-93-3	10					
2-Hexanone	591-78-6	10					
4-Methly-2-pentanone	108-10-1	10			4,000,000		
Acetone	67-64-1	10			8,000,000		
Benzene	71-43-2	10	500	500		34,500	
Bromodichloromethane	75-27-4	10			1,600,000	7,690	
Bromoform	75-25-2	10			1,600,000	127,000	
Bromomethane	74-83-9	10			112,000		
Carbon disulfide	75-15-0	10			8,000,000		
Carbon tetrachloride	56-23-5	10			5,600	7,690	
Chlorobenzene	108-90-7	10			1,600,000		
Chloroethane	75-00-3	10					
Chloroform	67-66-3	10			800,000	164,000	
Chloromethane	74-87-3	10				76,900	
cis-1,3-Dichloropropene	10061-01-5	10					
Dibromochloromethane	124-48-1	10			1,600,000		
Ethylbenzene	100-41-4	10	20,000	20,000	8,000,000		
Methylene Chloride (DCM)	75-09-2	10	500	500	4,800,000	133,000	
Styrene	100-42-5	10			16,000,000	33,300	
Tetrachloroethylene (PCE)	127-18-4	10	500	500	800,000	19,600	
Toluene	108-88-3	10	40,000	40,000	16,000,000		
Trans-1,3-Dichloropropene	10061-02-6	10					
Trichloroethylene	79-01-6	10	500	500		90,900	
Vinyl Chloride	75-01-4	10			435		
Xylenes (total)	1330-20-7	10	20,000	20,000	160,000,000		
SEMIVOLATILES							
1,2,4-Trichlorobenzene	120-82-1	330			800,000		
1,2-Dichlorobenzene	95-50-1	330			7,200,000		
1,3-Dichlorobenzene	541-73-1	330					
1,4-Dichlorbenzene	106-46-7	330				41,700	
2,2-Oxybis (1-Chloropropane)	108-60-1	330					
2,4,5 Trichlorophenol	95-95-4	1700			8,000,000		
2,4,6 Trichlorophenol	88-06-2	330				90,900	
2,4-Dichlorophenol	120-83-2	330			240,000		
2,4-Dimethylphenol	107-67-9	330			1,600,000		
2,4-Dinitrophenol	51-28-5	1700			160,000		
2,4-Dinitrotoluene	121-14-2	330			160,000	1,470	
2,6-Dinitrotoluene	606-20-2	330			80,000	1,470	
2-Chloronaphthalene	91-58-7	330					
2-Chlorophenol	95-57-8	330			400,000		
2-Methylnaphthalene	91-57-6	330					

(a) CRQL exceeds one or more cleanup criteria

Table 5

SOIL CLEANUP LEVELS AND QUANTITATION LIMITS

MTCA = Model Toxics Control Act PARAMETER	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/kg)	MTCA Method A (ug/kg)	MTCA Method A (Industrial) (ug/kg)	MTCA Method B Non-Carcinogen (ug/kg)	MTCA Method B Carcinogen (ug/kg)	Exceed -ance
2-Methylphenol	95-48-7	330					
2-Nitroaniline	88-74-4	1700					
2-Nitrophenol	88-75-5	330					
3,3-Dichlorobenzidine	91-94-1	330				2,200	
3-Nitroaniline	99-09-2	1700					
4,6-Dinitro-2-methylphenol	534-52-1	1700					
4-Bromophenyl-phenylether	101-55-3	330					
4-Chloro-3-methylphenol	59-50-7	330					
4-Chloroaniline	106-47-8	330			320,000		
4-Chlorophenyl-phenyl ether	7005-72-3	330					
4-Methylphenol	106-44-5	330					
4-Nitroaniline	100-01-6	1700					
4-Nitrophenol	100-02-7	1700					
Acenaphthene	83-32-9	330			4,800,000		
Acenaphthylene	208-96-8	330					
Anthracene	120-12-7	330			24,000,000		
Benzo(a)anthracene	56-55-3	330				172	(a)
Benzo(a)pyrene	50-32-8	330	1000	20,000		172	(a)
Benzo(b)fluoranthene	205-99-2	330				172	(a)
Benzo(g,h,i) perylene	191-24-2	10					
Benzo(k)fluoranthene	207-08-9	330				172	(a)
bis (2-Chlorethoxy) methane	111-91-1	330					
bis (2-Chlorethyl) ether	111-44-4	330					
Butylbenzyl phthalate	85-68-7	330			1,600,000		
Carbazole	86-74-8	330				50,000	
Chrysene	218-01-9	330				87	(a)
Di-n-octylphthalate	117-84-0	330			1,600,000		
Di(2-ethylhexyl)phthalate	117-81-7	330					
Dibenzo(a,h)anthracene	53-70-3	330				172	(a)
Dibenzofuran	132-64-9	330					
Di-n-butyl phthalate	84-74-2	330			8,000,000		
Diethyl phthalate	84-66-2	330			64,000,000		
Dimethylphthalate	131-11-3	330			80,000,000		
Fluoranthene	206-44-0	330			3,200,000		
Fluorene	86-73-7	330			3,200,000		
Hexachlorethane	67-72-1	330			80,000	71,400	
Hexachlorobenzene	118-74-1	330			64,000	625	
Hexachlorobutadiene	87-68-3	330			160,000	12,800	
Hexachlorocyclopentadiene (HEX)	77-47-4	330			560,000		
Indeno (1,2,3-cd) pyrene	193-39-5	10				172	
Isophorone	78-59-1	330			16,000,000	244,000	
N-Nitrolo-di-n-propylamine	621-64-7	330				143	(a)
N-nitrosodiphenylamine	86-30-6	330				204,000	
Naphthalene	91-20-3	330			320,000		
Nitrobenzene	98-95-3	330			40,000		
Pentachlorophenol	87-86-5	1700			2,400,000	8,330	
Phenanthrene	85-01-8	330					
Phenol	108-95-2	330			48,000,000		
Pyrene	129-00-0	330			2,400,000		

(a) CRQL exceeds one or more cleanup criteria

Table 5

SOIL CLEANUP LEVELS AND QUANTITATION LIMITS

MTCA = Model Toxics Control Act PARAMETER	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/kg)	MTCA Method A (ug/kg)	MTCA Method A (Industrial) (ug/kg)	MTCA Method B Non-Carcinogen (ug/kg)	MTCA Method B Carcinogen (ug/kg)	Exceed -ance
PESTICIDES / PCBs							
4,4-DDD	72-54-8	3.3			4,170		
4,4-DDE	72-55-9	3.3				2,940	
4,4-DDT	50-29-3	3.3	1000	5000	40,000	2,940	
Aldrin	309-00-2	1.7			2,400	58.8	
alpha-BHC	319-84-6	1.7					
alpha-Chlorodane	5103-71-9	1.7					
Aroclor 1016	12674-11-2	33	1000	10000			
Aroclor 1221	11104-28-2	33	1000	10000			
Aroclor 1232	11141-16-5	67	1000	10000			
Aroclor 1242	53469-21-9	33	1000	10000			
Aroclor 1248	12672-29-6	33	1000	10000			
Aroclor 1254	11097-69-1	33	1000	10000			
Aroclor 1260	11096-82-5	33	1000	10000			
beta-BHC	319-85-7	1.7					
delta-BHC	319-86-8	1.7					
Dieldrin	60-57-1	3.3			4,000	62.5	
Endosulfan I	959-98-8	1.7					
Endosulfan II	33213-65-9	3.3					
Endosulfan Sulfate	1031-07-8	3.3					
Endrin	72-20-8	3.3			24,000		
Endrin Aldehyde	7421-36-3	3.3					
Endrin Ketone	53494-70-5	3.3					
gamma-BHC (Lindane)	58-89-9	1.7	1000	20000	24,000	769	
gamma-Chlorodane	5103-74-2	1.7					
Heptachlor	76-44-8	1.7			40,000	222	
Heptachlor epoxide	1024-57-3	1.7			1,040	110	
Methoxychlor	72-43-5	17			400,000		
Toxaphene	8001-35-2					909	
HERBICIDES							
2,4 DB	94-82-69	609.7			640,000		
2,4,5-T	93-76-5	134			800,000		
2,4,5-TP (Silvex)	93-72-1	113.9					
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	804			800,000		
Dalapon	75-99-0	3886			2,400,000		
Dicamba	1918-00-9	180.9					
Dichlorprop	120-36-5	435.5					
Dinoseb (DNBP)	88-85-1	47			80,000		
MCPA	94-74-6	166830			40,000		(a)
MCPP	93-65-2	128640					
DIOXINS							
2,3,7,8 TCDD	1746-01-6	0.01				0.00676	(a)

(a) CRQL exceeds one or more cleanup criteria

Table 5

SOIL CLEANUP LEVELS AND QUANTITATION LIMITS

MTCA = Model Toxics Control Act PARAMETER	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/kg)	MTCA Method A (ug/kg)	MTCA Method A (Industrial) (ug/kg)	MTCA Method B Non-Carcinogen (ug/kg)	MTCA Method B Carcinogen (ug/kg)	Exceed -ance
PRIORITY POLLUTANT METALS		**CRQL levels for metals in soils are matrix dependent and are not published.**					
Aluminum	7429-90-5						
Antimony	7440-36-0				32,000		
Arsenic	7440-38-2		20,000	200,000	60,000	1,430	
Barium	7440-39-3				5,600,000		
Beryllium	7440-41-7				400,000	233	
Cadmium	7440-43-9		2000	10,000	40,000		
Calcium	7440-70-2						
Chromium (Total)	7440-47-3		100,000	500,000	400,000		
Cobalt	7440-48-4						
Copper	7440-50-8				2,960,000		
Cyanide	57-12-5				1,600,000		
Iron	7439-89-6						
Lead	7439-92-1		250,000	1,000,000			
Magnesium	7439-95-4						
Manganese	7439-96-5				2,640,000		
Mercury	7439-97-6		1000	1000	24,000		
Nickel	7440-02-0				1,600,000		
Potasium	7440-09-7						
Selenium	7782-49-2						
Silver	7440-22-4				240,000		
Sodium	7440-23-5						
Thallium	7440-28-0				5,600		
Vanadium	7440-62-2				560,000		
Zinc	7440-66-6				16,000,000		

(a) CRQL exceeds one or more cleanup criteria

Table 6

WATER CLEANUP LEVELS AND QUANTITATION LIMITS

MCL = Maximum Contaminant Level
MTCA = Model Toxics Control Act

Parameter	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/L)	Federal MCL (ug/L)	Status	MTCA Method A (ug/L)	MTCA Method B Non-Carcinogen (ug/L)	MTCA Method B Carcinogen (ug/L)	Exceed-ance
VOLATILES								
1,1,1-Trichloroethane	71-55-6	10	200	Final	200	720		
1,1,2,2-Tetrachloroethane	79-34-5	10					0.219	(a)
1,1,2-Trichloroethane	79-00-5	10	5	Proposed		32	0.768	(a)
1,1-Dichloroethane	75-34-3	10				800	0.481	(a)
1,1-Dichloroethylene	75-35-4	10	7	Final		72	0.0729	(a)
1,2-Dichloroethane	107-06-2	10	5	Final	5		0.481	(a)
1,2-Dichloroethene	540-59-0	10						
1,2-Dichloropropane	78-87-5	10	5	Final			0.643	(a)
2-Butanone (MEK)	78-93-3	10						
2-Hexanone	591-78-6	10						
4-Methly-2-pentanone	108-10-1	10				400		
Acetone	67-64-1	10				800		
Benzene	71-43-2	10	5	Final	5		1.51	(a)
Bromodichloromethane	75-27-4	10				160	0.337	(a)
Bromoform	75-25-2	10				160	5.54	(a)
Bromomethane	74-83-9	10				11.2		
Carbon Disulfide	75-15-0	10				800		
Carbon tetrachloride	56-23-5	10	5	Final		5.6	0.337	(a)
Chlorobenzene	108-90-7	10	100	Final		160		
Chloroethane	75-00-3	10						
Chloroform	67-66-3	10				80	7.17	(a)
Chloromethane	74-87-3	10					3.37	(a)
cis-1,3-Dichloropropene	10061-01-5	10						
Dibromochloromethane	124-48-1	10				160		
Ethylbenzene	100-41-4	10	700	Final	30	800		
Methylene Chloride (DCM)	75-09-2	10	0.5	Final	5	480	5.83	(a)
Styrene	100-42-5	10	100	Final		1600	1.46	(a)
Tetrachloroethylene (PCE)	127-18-4	10	5	Final	5	80	0.858	(a)
Toluene	108-88-3	10	1000	Final	40	1600		
trans-1,3-Dichloropropene	10061-02-6	10						
Trichloroethylene	79-01-6	10	5	Final	5		3.98	(a)
Vinyl Chloride	75-01-4	10	2	Final	0.2		0.019	(a)
Xylenes (total)	1330-20-7	10	10,000	Final	20	16,000		
SEMIVOLATILES								
1,2,4-Trichlorobenzene	120-82-1	10	70	Proposed		80		
1,2-Dichlorobenzene	95-50-1	10	600	Final		720		
1,3-Dichlorobenzene	541-73-1	10						
1,4-Dichlorobenzene	106-46-7	10	75	Final			1.82	(a)
2,2-Oxybis (1-Chloropropane)	108-60-1	10						
2,4,5 Trichlorophenol	95-95-4	50				1600		
2,4,6 Trichlorophenol	88-06-2	10					7.95	(a)
2,4-Dichlorophenol	120-83-2	10				48		
2,4-Dimethylphenol	107-67-9	10				320		
2,4-Dinitrophenol	51-28-5	50				32		(a)
2,4-Dinitrotoluene	121-14-2	10				32	0.129	(a)
2,6-Dinitrotoluene	606-20-2	10				16	0.129	(a)
2-Chloronaphthalene	91-58-7	10						
2-Chlorophenol	95-57-8	10				80		
2-Methylnaphthalene	91-57-6	10						

(a) CRQL exceeds one or more cleanup criteria

(s) = Secondary MCL

Table 6

WATER CLEANUP LEVELS AND QUANTITATION LIMITS

MCL = Maximum Contaminant Level
MTCA = Model Toxics Control Act

Parameter	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/L)	Federal MCL (ug/L)	Status	MTCA Method A (ug/L)	MTCA Method B Non-Carcinogen (ug/L)	MTCA Method B Carcinogen (ug/L)	Exceed-ance
2-Methylphenol	95-48-7	10						
2-Nitroaniline	88-74-4	50						
2-Nitrophenol	88-75-5	10						
3,3-Dichlorobenzidine	91-94-1	10					0.194	(a)
3-Nitroaniline	99-09-2	50						
4,6-Dinitro-2-methylphenol	534-52-1	50						
4-Bromophenyl-phenylether	101-55-3	10						
4-Chloro-3-methylphenol	59-50-7	10						
4-Chloroaniline	106-47-8	10				64		
4-Chlorophenyl-phenyl ether	7005-72-3	10						
4-Methylphenol	106-44-5	10						
4-Nitroaniline	100-01-6	50						
4-Nitrophenol	100-02-7	50						
Acenaphthene	83-32-9	10				960		
Acenaphthylene	208-96-8	10						
Anthracene	120-12-7	10				4800		
Benzo(a)anthracene	56-55-3	10	0.1	Proposed			0.0151	(a)
Benzo(a)pyrene	50-32-8	10	0.2	Proposed			0.0151	(a)
Benzo(b)fluoranthene	205-99-2	10	0.2	Proposed			0.0151	(a)
Benzo(g,h,i) perylene	191-24-2	10						
Benzo(k)fluoranthene	207-08-9	10	0.2	Proposed			0.0151	(a)
bis (2-Chlorethoxy) methane	111-91-1	10						
bis (2-Chlorethyl) ether	111-44-4	10						
Carbazole	86-74-8	10					4.37	(a)
Chrysene	218-01-9	10	0.2	Proposed			0.00761	(a)
Di-n-octylphthalate	117-84-0	10				320		
Di(2-ethylhexyl)phthalate	117-81-7	10	6	Proposed				(a)
Dibenzo(a,h)anthracene	53-70-3	10	0.3	Proposed			0.0151	(a)
Dibenzofuran	132-64-9	10						
Di-n-butyl phthalate	84-74-2	10		Proposed		1600		
Diethyl phthalate	84-66-2	10	4	Proposed		12,800		(a)
Dimethylphthalate	131-11-3	10				16,000		
Fluoranthene	206-44-0	10				640		
Fluorene	86-73-7	10				640		
Hexachlorethane	67-72-1	10				16	6.25	(a)
Hexachlorobenzene	118-74-1	10	1	Proposed		12.8	0.0547	(a)
Hexachlorobutadiene	87-68-3	10				16	0.561	(a)
Hexachlorocyclopentadiene (HEX)	77-47-4	10	50	Proposed		112		
Indeno (1,2,3-cd) pyrene	193-39-5	10	0.4	Proposed			0.0151	(a)
Isophorone	78-59-1	10				3200	21.3	
N-Nitroso-di-n-propylamine	621-64-7	10					0.0125	(a)
N-nitrosodiphenylamine	86-30-6	10					17.9	
Naphthalene	91-20-3	10				32		
Nitrobenzene	98-95-3	10				8		(a)
Pentachlorophenol	87-86-5	50	1	Proposed		480	0.729	(a)
Phenanthrene	85-01-8	10						
Phenol	108-95-2	10				9600		
Pyrene	129-00-0	10				480		

(a) CRQL exceeds one or more cleanup criteria

(s) = Secondary MCL

Table 6

WATER CLEANUP LEVELS AND QUANTITATION LIMITS

MCL = Maximum Contaminant Level MTCA = Model Toxics Control Act Parameter	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/L)	Federal MCL (ug/L)	Status	MTCA Method A (ug/L)	MTCA Method B Non-Carcinogen (ug/L)	MTCA Method B Carcinogen (ug/L)	Exceedance
PESTICIDES / PCBs								
4,4-DDD	72-54-8	0.1					0.365	
4,4-DDE	72-55-9	0.1					0.257	
4,4-DDT	50-29-3	0.1			0.1	8	0.257	
Aldrin	309-00-2	0.05				0.48	0.00515	(a)
alpha-BHC	319-84-6	0.05						
alpha-Chlordane	5103-71-9	0.05						
Aroclor 1016	12674-11-2	1			0.1			(a)
Aroclor 1221	11104-28-2	1			0.1			(a)
Aroclor 1232	11141-16-5	2			0.1			(a)
Aroclor 1242	53469-21-9	1			0.1			(a)
Aroclor 1248	12672-29-6	1			0.1			(a)
Aroclor 1254	11097-69-1	1			0.1			(a)
Aroclor 1260	11096-82-5	1			0.1			(a)
beta-BHC	319-85-7	0.05						
delta-BHC	319-86-8	0.05						
Dieldrin	60-57-1	0.1				0.8	0.00547	(a)
Endosulfan I	959-98-8	0.05						
Endosulfan II	33213-65-9	0.1						
Endosulfan Sulfate	1031-07-8	0.1						
Endrin	72-20-8	0.1	0.2	Final		4.8		
Endrin Aldehyde	7421-36-3	0.1						
Endrin Ketone	53494-70-5	0.1						
gamma-BHC Lindane	58-89-9	0.05	0.2	Final	0.2	4.8	0.0673	
gamma-Chlordane	5103-74-2	0.05						
Heptachlor	76-44-8	0.05	0.4	Final		8	0.0194	(a)
Heptachlor epoxide	1024-57-3	0.05	0.2	Final		0.208	0.00962	(a)
Methoxychlor	72-43-5	0.5	40	Final		80		
Toxaphene	8001-35-2	5	3	Final			0.0795	(a)
HERBICIDES								
2,4 DB	94-82-6	9.1				128		
2,4,5-T	93-76-5	2				160		
2,4,5-TP (Silvex)	93-72-1	1.7	50	Final				
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	12	70	Final		160		
Dalapon	75-99-0	58	200	Proposed		480		
Dicamba	1918-00-9	2.7						
Dichlorprop	120-36-5	6.5						
Dinoseb (DNBP)	88-85-1	0.7	7	Proposed		16		
MCPA	94-74-6	2490				8		(a)
MCPP	93-65-2	1920						
DIOXINS								
2,3,7,8 TCDD	1746-01-6					0.00676		(a)

(a) CRQL exceeds one or more cleanup criteria

(s) = Secondary MCL

Table 6

WATER CLEANUP LEVELS AND QUANTITATION LIMITS

MCL = Maximum Contaminant Level MTCA = Model Toxics Control Act Parameter	Chemical Abstracts (CAS) Registry Number	Contract Required Quantitation Limit (CRQL) (ug/L)	Federal MCL (ug/L)	Status	MTCA Method A (ug/L)	MTCA Method B Non-Carcinogen (ug/L)	MTCA Method B Carcinogen (ug/L)	Exceed-ance
PRIORITY POLLUTANT METALS								
Aluminum	7429-90-5	200	50-200 (s)	Final				(a)
Antimony	7440-36-0	60	6	Proposed		6.4		(a)
Arsenic	7440-38-2	10	50	Final	5	4.8	0.05	(a)
Barium	7440-39-3	200	1000	Final		1120		
Beryllium	7440-41-7	5	4	Proposed		80	0.0203	(a)
Cadmium	7440-43-9	5	5	Final	5	8		
Calcium	7440-70-2	5000						
Chromium (Total)	7440-47-3	10	100	Final	50	80		
Cobalt	7440-48-4	50						
Copper	7440-50-8	25	1000 (s)	Final		592		
Cyanide	57-12-5	10	200	Proposed		320		
Iron	7439-89-6	100	300 (s)	Final				
Lead	7439-92-1	3	50	Final	5			
Magnesium	7439-95-4	5000						
Manganese	7439-96-5	15	50 (s)	Final		528		
Mercury	7439-97-6	0.2	2	Final	2	4.8		
Nickel	7440-02-0	40	100	Proposed		320		
Potassium	7440-09-7	5000						
Selenium	7782-49-2	5	50	Final				
Silver	7440-22-4	10	50	Final		48		
Sodium	7440-23-5	5000						
Thallium	7440-28-0	10	2	Proposed		1.12		(a)
Vanadium	7440-62-2	50				112		
Zinc	7440-66-6	20	5000 (s)	Final		3200		

(a) CRQL exceeds one or more cleanup criteria

(s) = Secondary MCL

is based on the premise that the data collected will be evaluated under the criteria set out in WAC 173-340-707(2) and that modifications are therefore not appropriate.

The representativeness, precision, accuracy, completeness, and comparability of the data have been considered in the development of the Field Sampling Plan, the Data Management Plan, and this QAPP. The data collection components and documentation have been identified and addressed in detail in these plans. The following discussions of accuracy, precision, completeness, representativeness, and comparability include and represent the objectives set by Burlington for this project.

4.1 Accuracy

Accuracy is defined as the degree of agreement (nearness) of a measurement or the mean of a set of results to an accepted reference or true value. Accuracy is assessed by means of reference samples and percent recoveries. The project objectives for accuracy are to provide data for percent recovery within the guidelines presented in the EPA Contract Laboratory Program (CLP).

4.2 Precision

Precision is the measure of mutual agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analysis and is best expressed in terms of the standard deviation derived under prescribed similar conditions. The project objectives for precision are to generate data for percent relative standard deviation (RSD) within the guidelines presented in the CLP.

4.3 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected to be collected under normal operating conditions. Two completeness objectives will be calculated: one based on the total number of samples collected and the second based on those samples reaching the laboratories intact. The goal of this QA/QC program is to generate valid data for at least 90 percent of the samples collected and 95 percent of the samples analyzed by the laboratories.

4.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, a process condition, an environmental condition, or parameter variations at a sampling point.

The field QA/QC procedures for sample handling, including chain of custody, will provide for sample integrity until the time of analysis. To make certain that the analytical results of this assessment are representative of the true field conditions, appropriate laboratory QA/QC procedures are prescribed.

4.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. To achieve comparability in this project, the data generated will be reported using units of ug/L and ug/kg for organics, and mg/L and mg/kg for inorganics.

5 SAMPLING PROCEDURES

All samples will be collected in accordance with the procedures outlined in the Field Sampling Plan for the Phase I Remedial Investigation of the Pasco Landfill.

6 SAMPLE CUSTODY AND DOCUMENTATION

This project-specific QAPP requires documentation concerning the collection of samples, field QA/QC, and sample custody. Procedures for this documentation follow.

6.1 Sample Identification and Labelling

Each sample will be assigned a unique sample identification code. The alphanumeric code will contain sufficient information to identify the overall site location and the sample medium (groundwater, soil, or soil-gas). The code will consist of three alphanumeric strings separated by two hyphens. The first string will consist of the three letters "PLF" to designate the Pasco Landfill as the overall site location. The following two alphanumeric strings will identify the sample medium and sample sequence number. For instance, the code "PLF-GW-001" designates groundwater sample number 1. The codes "PLF-SS-003", "PLF-SBS-004", and "PLF-SG-001" designate surface soil sample number 3, subsurface soil sample number 4, and soil-gas sample number 1, respectively. Duplicate samples will be given sequential numbers. As an example, if two groundwater samples are collected from the same monitoring well (and the previously collected groundwater sample was identified as PLF-GW-005), the samples would be identified as PLF-GW-006 and -007. The analytical laboratory will not be informed of which samples are duplicates. Further sample documentation protocols are provided in Section 3 of the FSP.

All sample containers will be affixed with a label to prevent misidentification of samples. The label will include, at a minimum, the following:

- initials of collector;
- date and time of collection;
- location;

- sample identification code;
- analyses; and
- preservatives.

6.2 Field Documentation

Information pertinent to the work performed will be recorded in logbooks and on field forms for sampling events and daily activities. Documentation by Burlington will be stored in the Burlington project file at the Seattle, Washington, office at the completion of field work. The field forms included in Appendix B are anticipated to be used for this project. Further details on field documentation are provided in Section 3 of the FSP.

6.3 Chain-of-Custody Record

To establish the documentation necessary to trace sample possession from the time of collection, a serially numbered chain-of-custody (COC) record will be filled out to accompany each sample. The COC record is included in Appendix B. Further details on chain-of-custody procedures are provided in Section 3 of the FSP.

6.4 Custody Seals

Custody seals shall be used to seal each sample container prior to sample packaging in ice chests. Sample transport ice chests shall also be sealed after packing prior to transfer to the sample transportation agent. Sampling personnel will place a signed and dated custody seal across the opening points (minimum of one) of the containers.

6.5 Sample Shipping Procedures

Except for coliform bacteria samples, all samples will be transported by a next-day delivery service to the laboratory for chemical analysis. The samples will be accompanied by the COC record. All samples will be delivered to the person in the laboratory authorized to receive samples (sample custodian). Coliform samples will be delivered to the laboratory within six hours of collecting sample.

When a sample set is picked up by the delivery service, it will be packaged in a proper shipping container to avoid leakage and/or breakage. Also, the shipper will receive a copy of the shipping documentation. This documentation will be placed in the project file at the Burlington office.

Upon receipt of the shipping container, the laboratory will inspect the custody seal for its integrity. The chest will be opened and the shipment checked versus the COC. Any inconsistencies or problems with a sample shipment (such as breakage) will be reported to the QA/QC Coordinator for immediate resolution. When any/all problems are resolved, the corrective action will be documented. The official custody of the samples will be accepted by the laboratory by signing the COC. The samples will then be tracked through the laboratory by internal custody procedures. Further details on sample shipping procedures are provided in Section 3 of the FSP.

6.6 Investigative Waste Profiling

Wastes generated during the field investigation, such as soil cuttings and well development water, will be handled as specified in the Investigative Waste Management plan. A Generator's Waste Material Profile Sheet (Appendix C) will be completed for each waste stream and submitted to the Burlington Laboratory for processing.

7 CALIBRATION PROCEDURES AND FREQUENCY

Calibration protocols and methods are provided in this section.

7.1 Photoionization Detector

The calibration procedures and frequency are described in the Health and Safety Plan, (Volume IV), Burlington's Safety Operating Procedure (HSOP) for photoionization detectors (PIDs).

7.2 Combustible-Gas Indicator

The calibration procedures and frequency are described in the Health and Safety Plan, (Volume IV), Burlington's HSOP for the combustible-gas indicator.

7.3 Hydrogen Sulfide Detector

Burlington personnel will follow the manufacturer's instructions for calibration of the hydrogen sulfide detector. The instructions are given in the Health and Safety Plan, (Volume IV).

7.4 pH Meter

The calibration procedures and frequency are described in Appendix D, Burlington's Standard Operating Procedure (SOP) for the pH meter.

7.5 Specific Conductivity Meter

The calibration procedures and frequency are described in Appendix D, Burlington's SOP for the specific conductivity meter.

7.6 Laboratory Equipment

The laboratories in Table 1 will perform the analyses of the samples collected at the Pasco Landfill Site. The laboratory quality control procedures, which include instrument calibration, are described in Appendix A, Laboratory QA/QC Plans.

7.7 RECON® System

The RECON System Standard Operating Procedures are provided in Appendix F.

8 ANALYTICAL PROCEDURES

The analytical methods chosen for this project are listed in Table 4 of the Sampling and Analysis Plan for the Phase I Remedial Investigation of the Pasco Landfill. Table 6 of the Field Sampling Plan gives sample holding times, sample containers, and sample preservation and handling.

9 DATA REDUCTION, VALIDATION, AND REPORTING

The data analysis scheme, units, and equations used to calculate the various constituent concentrations are provided in the appropriate methods as outlined in the project sampling plan.

9.1 Data Reduction

All data reductions will be performed by the laboratory according to the procedures outlined in the appropriate analysis method.

9.2 Data Validation

The principal criteria that will be used to validate the data integrity during collection and reporting of the data are:

- verification by the laboratory QC officer that all raw data generated have been properly stored and documented in hard copy and that storage locations in the laboratory are coincident with chain-of-custody records;
- examination of the raw data by the Analysis Coordinator to verify adequacy of documentation and check the accuracy of calculations;
- confirmation that calibration standards are within the expected values;
- reporting of all associated blank, duplicate, spike, standard, and QC data compared with results for analyses of each batch of samples; and

- reporting of all analytical data for samples with no values rejected as outliers because of the completeness goal of 95 percent for the analytical support of this project.

9.3 Data Management

The field and analytical data gathered during this project will be managed using a computer-based data management system as presented in the Data Management Plan. This system will provide efficiency in data handling, tabulation, and analysis. The system will also provide an integral portion of the quality assurance/quality control developed for the project.

All measurements taken during this project will be identified by source and type to avoid ambiguity. Field and analytical data will be input to the computerized data management system and maintained under the supervision of the data system manager.

All data input will be checked for accuracy and completeness and will have undergone review and approval by the Field and Analytical QC Coordinator prior to addition to the master data base. The system manager will be responsible for maintaining the integrity of the data and fulfilling requests for data access.

Standard computer software will be used for data management, analysis, and tabulation. These products include Lotus 1-2-3 and SAS (SAS Institute). The extensive statistical analysis and data tabulation capability of the SAS software package will be used for conducting appropriate statistical analyses and data tabulations.

9.4 Reporting

Analytical results will be tabulated and submitted to the project manager on a regular basis after completion of the necessary QA/QC steps and document review given in this QAPP. The results of the evaluation of QAPP compliance will be presented in the final RI Phase I report. The content of this Quality Assurance Compliance review summary is presented in Section 15.1 of this QAPP.

10 INTERNAL QUALITY CONTROL PROGRAM

The overall effectiveness of the quality control program is dependent upon the performance of field sampling activities and laboratory operations in accordance with a plan that systematically evaluates the precision and accuracy of the analysis.

10.1 Field Quality Control Checks

The internal field sampling quality control program includes the use of duplicate samples, equipment (rinsate) blanks, and travel blanks. Table 7 lists the minimum number of blanks and duplicate samples to be analyzed.

10.2 Laboratory Quality Control Checks

The routine internal quality control program will include daily calibration of instruments using certified standards when possible. Glassware will be checked for cleanliness and for detergent removal prior to each analysis run. Nanograde quality solvents will be used for trace organic applications. Each lot of solvent will be checked to demonstrate its suitability for the intended analysis. The highest purity standards commercially available, usually 98 percent, will be used for calibration.

To demonstrate that all analytical materials, i.e., reagents, glassware, and solvents, are free of interferences, method blanks will be run at a minimum of one for every 20 samples (or analysis batch). Accuracy will be assessed using spikes of field samples at a minimum frequency of five percent. Duplicates of field samples will be randomly selected and analyzed

Table 7

MINIMUM NUMBER OF BLANKS AND DUPLICATE SAMPLES TO BE ANALYZED

PASCO LANDFILL
PASCO, WASHINGTON

Type of Blank/Split	Analytes	Minimum Number Analyzed
Equipment (Rinsate) Blank	Same as samples	1 per 20 samples (soil and/or water)
Travel Blank	VOCs only	1 per sample batch shipment (water and air)
Duplicate Sample	Same as samples	1 per 20 samples (soil and/or water)

at a minimum of one for every 20 samples (or analysis batch) to document the precision of the analysis. A laboratory quality control check sample will be analyzed with each analysis batch with a minimum of one per 20 samples. Overall laboratory quality control checks will exceed 20 percent of all samples analyzed for the project.

The detailed laboratory quality control procedures will be documented in the Laboratory QA/QC Manual.

11 PERFORMANCE AND SYSTEM AUDITS

Two types of audit procedures will be used to assess and document the project proceedings: performance audits and system audits. These audits form one of the bases for corrective action requirements and constitute a permanent record of the conformance of the measurement systems to QA requirements.

Performance audits will consist largely of continual reviews of recent data and documentation. These audits will rely heavily on analyzing duplicates of actual samples, field and method blanks, and spikes.

A system audit will be performed to check adherence to approved field procedures. At least once during the sampling event, an auditor will accompany the field sampling team to evaluate the sample collection, document control, and chain-of-custody procedures based on the Quality Assurance Project Plan. Any inconsistencies and/or omissions will be taken into corrective action. The project field audit checklist is provided in Appendix G.

The analytical laboratories will be audited by a Burlington chemist prior to the initiation of any field work on this project. The laboratory audits will be carried out to cover analytical methodology quality control procedures.

Peer review of all deliverable reports and data supporting this project will be performed by technically qualified individuals.

12 MAINTENANCE

All maintenance for the field equipment is outlined in the SOPs for the respective pieces of equipment. The laboratory quality control plans, Appendix A, contains a summary of all maintenance procedures for the laboratory instrumentation.

13 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The procedures in this section will be used by Burlington to assess QC data. Field or laboratory duplicate samples and laboratory replicate analyses will be used to assess precision. Field or laboratory spike samples will be used to measure accuracy. Check samples will be used to evaluate comparability of the analytical results. These techniques are described in the following EPA documents: QAMS - 005/80 (EPA, 1980), SW-846 third edition (EPA, 1986), Contract Laboratory Program Statement of Work for Organics Analysis: Multimedia, Multiconcentration (EPA, 1990), and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1988), and National Functional Guidelines for Organic Data Review (EPA, 1991).

13.1 Procedures for the Assessment of Split, Duplicate, or Replicate Measurements

Replicate analysis of the same sample and analysis of duplicate or split samples will be evaluated by calculating the relative percent difference (RPD).

$$RPD = \frac{|X_1 - X_2|}{\bar{X}} \times 100\%$$

where X_i is the "i"th result in the set and $\bar{X}$ is the arithmetic mean of the results, i.e. $\bar{X} = \frac{(X_1 + X_2)}{2}$

13.2 Procedure for Assessment of Surrogate Recovery

Surrogate recovery will be evaluated by calculating the ratio of concentration of the surrogate measured in the sample relative to the calculated concentration of the surrogate in the sample matrix. Surrogate recovery is calculated as:

For liquid samples:

$$\% \text{ Recovery} = \frac{C_s \times V_s}{Q_s} \times 100$$

and for solid samples:

$$\% \text{ Recovery} = \frac{C_s \times W_s}{Q_s} \times 100$$

where:

C_s = measured concentration of surrogate compound in sample in mg/L (or mg/kg);

V_s (or W_s) = total volume (or weight) of sample to which the surrogate was added in L (or kg); and

Q_s = quantity of surrogate compound added to the sample in mg.

13.3 Procedure for Assessment of Spike Recovery

The percent recovery for spike samples will be calculated by the ratio of the concentration measured in the spiked sample (or blank) relative to the sum of the concentration measured in an aliquot of the original sample (or blank) and the calculated concentration of the known quantity of spiking solution added to a known quantity of the sample matrix. Spike recovery is calculated as:

$$\% \text{ Recovery} = \frac{C_t}{C_b + C_s} \times 100$$

where:

C_t = total concentration measured in spiked sample (or spiked blank);

C_b = concentration measured in an aliquot of the sample (or blank) prior to spiking; and

C_s = resulting concentration of the addition of a known quantity of the spiking compound to a known quantity of the sample matrix.

All measurements and results will be in the same concentration units.

13.4 Completeness

The completeness of the field sampling effort is defined as the percentage ratio of the number of samples received at the laboratory in a condition suitable for analysis divided by the number of samples to be collected as defined in the project specifications.

The completeness of the analytical effort is expressed as the percentage ratio of analytical results that meet the project QA requirements divided by the number of samples received at the laboratory in a condition suitable for analysis.

14 CORRECTIVE ACTION

For each analytical method employed in this program, the precision and accuracy will be tracked. The calculations for spike recoveries will also be made, and the standard deviation of the replicate set will be computed. Whenever either the relative standard deviation of replicate results or the spike recoveries of either set are out of compliance according to the guidelines set forth in the Contract Laboratory Program of Work for Organics Analysis: Multimedia, Multiconcentration (EPA, 1990), corrective action will be taken to improve performance prior to analysis of the next group of samples.

If weaknesses or problems are uncovered during system or performance audits, corrective action will be initiated immediately.

Laboratory corrective action may include, but will not necessarily be limited to, the following: recalibration of instruments using freshly prepared calibration standards; replacements of lots of solvent or other reagents that gave unacceptable blank values; additional training of laboratory personnel in correct implementation of sample preparation and analysis methods; and reassignment of personnel, when necessary.

Whenever a corrective action is necessary to eliminate the cause of nonconformance in the field or the laboratory, the following closed-loop corrective action system will be used. This procedure is taken from the "Quality Assurance Handbook for Air Pollution Measurement System. Volume 1. Principles" (EPA-600/ 4-76-005, 1976). As appropriate, each of the following steps will be taken:

1. The problem is defined.

2. Responsibility for investigating the problem is assigned.

3. The cause of the problem is investigated and defined.

4. A corrective action to eliminate the problem is defined.

5. Responsibility for implementing the corrective action is assigned and accepted.

6. The effectiveness of the corrective action is established and the correction implemented.

7. The fact that the corrective action has eliminated the problem is verified and documented.

8. The impact on the quality of the project is assessed.

9. A report on the corrective action is issued.

15 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The project team will communicate on a regular basis to ascertain if QA/QC practices are being carried out and to address possible or potential problem areas. It will be important that all data anomalies be investigated to indicate that they are not a result of personnel or instrument deviation, but are a true reflection of the methodology or task.

15.1 Quality Assurance Reports

Periodic reports will be made to the project manager by the QA officer on the performance of the measurement system and the data quality. Minimally, these reports will include:

- periodic assessment of measurement quality indicators such as data accuracy, precision, and completeness;
- results of performance audits;
- results of system audits; and
- significant QA/QC problems and recommended solutions.

The final RI Phase I report will contain a separate section to review quality of the data. At a minimum, the following information will be covered:

- assessment of measurement data precision, accuracy, and completeness;
- system and performance audit results;
- significant QA/QC problems and implemented solutions; and
- impact on the quality of the project.

REFERENCES

Washington State Department of Ecology. 1991. Guidelines and Specifications for Preparing Quality Assurance Project Plans. Environmental Investigations and Laboratory Services Program.

United States Environmental Protection Agency. 1991. National Functional Guidelines for Organic Data Review. Multi-Media, Multi-Concentration (OLM01.0) and Low Concentration Water (OLC01.0). EPA Contract laboratory Program.

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IWMP

Phase I Remedial Investigation
Pasco Landfill
Pasco, Washington

Volume II - Sampling and Analysis Plan

Part 3 - Investigative Waste Management Plan

November 1992

Prepared for:

Pasco Landfill PLP Group

Project 624419

Prepared by:

BURLINGTON ENVIRONMENTAL INC.
Technical Services Division
7440 West Marginal Way South
Seattle, Washington 98108-4141
(206) 767-3306

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ABSTRACT

The Phase I Remedial Investigation Work Plan for the Pasco Landfill in Pasco, Washington describes the various steps or phases essential to the investigation process and defines the activities that will be conducted during this investigation. This Phase I Remedial Investigation will be completed under an Agreed Order with the Washington Department of Ecology (Order No. DE92TC-E105) and in compliance with the Model Toxics Control Act (Chapter 70.105D RCW and Chapter 173-340 WAC). Because the Pasco Landfill site is on the National Priority List, the Phase I Remedial Investigation will also be conducted in a manner consistent with the National Contingency Plan (40 CFR Part 300).

The objective of this investigation is to gain additional information on the nature and extent of contamination in the air, soil, and groundwater near potential contaminant sources at the Pasco Landfill. A Preliminary Risk Assessment will also be completed. This Work Plan describes the various steps proposed for gathering the necessary site characterization information and data and for performing the Preliminary Risk Assessment.

As part of the Work Plan (Volume I), a Sampling and Analysis Plan (Volume II), a Data Management Plan (Volume III), a Health and Safety Plan (Volume IV), and a Public Participation Plan (Volume V) have been developed for the performance of this project. Completion of the work defined in these planning documents will be followed by a Phase II Remedial Investigation (if necessary) and a Feasibility Study. The Washington Department of Ecology will ascertain the need for additional remedial investigation activities and the scope of the Feasibility Study based on the findings from the Phase I Remedial Investigation. Following the Feasibility Study, any need for remedial action will be determined by the Washington Department of Ecology.

1 INTRODUCTION

The Pasco Landfill Investigative Waste Management Plan (IWMP) details procedures for handling and disposal of all wastes generated during Phase I of the Pasco Landfill Remedial Investigation. These investigative wastes will include soil cuttings from monitoring wells and soil borings, well development and pump test waters, and other non-regulated, solid, and liquid wastes produced as a result of the investigation.

2 WASTE HANDLING AND DISPOSAL PROCEDURES

The following sections provide procedures for handling of wastes generated during the Phase I RI.

2.1 Shallow Soil Sample Waste

Shallow soil samples will be collected from the soil surface and from hand auger holes. Soil material removed from these locations that is not submitted for laboratory analysis will be drummed. The drummed soils will be staged on site pending laboratory analysis of the shallow surface soil samples. The process to be followed for the Pasco Landfill investigative wastes begins with completion of Generator's Waste Material Profile Sheets (see Appendix C, Sampling and Analysis Plan). Separate profile forms will be submitted for each waste stream. The profile forms will be completed based on the soil sample analytical results and sample- and location-specific knowledge. A representative sample will then be collected for each waste stream and submitted to the Burlington Environmental Inc. (Burlington) Corporate Laboratory along with the corresponding profiles.

Confirmation laboratory analysis will be completed by the Burlington Laboratory to assure that the waste streams and completed profiles are consistent. Following verification of the profile information, the profiles and analytical results will be evaluated by the Burlington Regulatory Affairs Department to determine which waste streams are non-regulated or are regulated as hazardous or dangerous wastes. Non-regulated wastes will be disposed on site at the active sanitary landfill. For the hazardous and dangerous wastes, Regulatory Affairs Department personnel will confirm that the waste streams can be handled within existing treatment, storage, and disposal (TSD) permit requirements. If the waste streams can be handled under the existing permits, the Burlington Operations Department will receive the profiles and all supporting documentation and determine how the waste streams can be handled/treated. A follow-up review will then be made by the Regulatory Affairs Department to confirm waste code designations and as a check on the Operations Department determinations. Finally, the proposed waste stream transportation, treatment, and disposal costs will be compiled and a contract will be written for completion of these services.

All applicable state and federal hazardous and dangerous waste regulations will be followed during the actual waste transport, treatment, and disposal (40 CFR Part 261, 49 CFR Parts 170-178, and WAC 173-303). Following final waste disposal or destruction, a certification will be provided that specifies the treatment or disposal processes used.

2.2 Soil Boring and Monitoring Well Cuttings

All soil produced during the drilling of the soil borings and monitoring wells will be drummed on a hole-by-hole basis and handled in a manner similar to that outlined in Section 2.1. Each drum will be labelled with the following:

- borehole designation;
- type of material;
- depth interval in borehole; and
- date collected.

2.3 Well Development and Purge Water

All water from purging and development of monitoring wells will be drummed on a hole-by-hole basis. Each drum will be labelled with the following:

- monitoring well designation;
- type of material; and
- date collected.

These drums will be staged on site until the results of laboratory tests have been reviewed. If laboratory analytical results indicate that surface discharge requirements of the Washington State Groundwater Quality Standards (WAC 173-200) have been met, specific drums meeting these requirements will be discharged to the ground surface in the area west of Well 4, west of the present active landfill (see Section 2.4 of this plan regarding disposal of pumping test water). Water that does not meet the surface discharge requirements of WAC 173-200 will be handled in a manner similar to that described for drummed soils (Section 2.1), with the exception that liquids will not be discharged into the sanitary landfill.

2.4 Pumping Test Water

Pumping test water from Well MW-15 is expected to meet the applicable requirements of WAC 173-200. Surface discharge of this water will be through a commercial irrigation sprinkler in the area to the west of the active landfill, near Well 4. The pumping test water will be discharged at a rate of approximately 100 gallons per minute for a period of 72 hours. Burlington will monitor specific conductance of the water every six hours throughout the test to evaluate whether the quality of the discharge water is stable.

Preliminary modelling data for the planned pumping test, in conjunction with analytical data from adjacent monitoring wells, including MW-5, indicate that the water discharged will not contain elevated levels of organic or inorganic contaminants. As a precautionary measure, Burlington will develop and sample Well MW-15 prior to the pumping test. Sample handling and documentation will conform to the guidelines in the Field Sampling Plan. The sample will be submitted to an accredited laboratory for analysis of the following constituents:

- minimal functional standards;
- volatile organic compounds;
- semivolatile organic compounds;
- chlorinated pesticides and PCBs;
- herbicides;
- priority pollutant metals; and
- radionuclides.

Burlington will submit the results of laboratory analyses to the Washington State Department of Ecology (Ecology), and the pumping test and associated surface discharge will not be initiated until approval from Ecology is received. If Ecology denies the proposed surface disposal, Burlington will evaluate the feasibility of alternate water disposal options.

2.5 Miscellaneous Investigative Wastes

All non-contaminated waste such as bags, washed gloves, and material scraps will be segregated from other wastes. This material will be bagged or otherwise contained and disposed in the on-site municipal landfill. Other miscellaneous materials such as used rope, Tyvek suits, and soiled gloves will also be disposed in the on-site municipal landfill. All decontamination rinsate and discarded water samples will be containerized on site and handled in the same manner as described in Section 2.4.